DEPARTMENT OF TRANSPORTATION AND ENVIRONMENTAL SERVICES
Division of Environmental Quality
P.O. Box 178 – City Hall
Alexandria, Virginia 22313
http://alexandriava.gov/tes/DEQ/

January 14, 2008

Richard D. Langford, Chairman
Bruce C. Buckheit
John N. Hanson
Hullihen W. Moore
Vivian E. Thomson
State Air Pollution Control Board
629 East Main Street
Richmond, Virginia 23219

David K. Paylor, Director
Virginia Department of Environmental Quality
629 East Main Street
Richmond, Virginia 23219

Re: $PM_{2.5}$ Ambient Air Quality Impact Analysis and Particulate Matter CEMS Mirant Potomac River Generating Station, Alexandria, Virginia

Honorable Board Members and Director Paylor:

The City of Alexandria ("Alexandria") first requested of the State Air Pollution Control Board ("SAPCB") and Virginia Department of Environmental Quality ("VDEQ") in 2004 that the operation of Mirant Potomac River Generating Station ("PRGS") be constrained by permitted emission limits that protect the $PM_{2.5}$ National Ambient Air Quality Standards ("NAAQS"). Now, four years later, these statutory requirements remain unfulfilled. The PRGS's ambient $PM_{2.5}$ impacts must be analyzed with consideration of the $PM_{2.5}$ NAAQS as part of pending permits.

Alexandria is writing to present to you detailed information on (i) standard modeling procedures that other states such as New Jersey, New York and Connecticut use to determine $PM_{2.5}$ permit emission limits; (ii) PM Continuous Emissions Monitoring System ("CEMS') installations in the U.S. and their use for PM compliance purposes; and (iii) Alexandria's modeling results using these standard modeling procedures, that overwhelmingly demonstrate the need for a stringent $PM_{2.5}$ limit for PRGS. Based on this information, Alexandria requests that the SAPCB and VDEQ use the same standard modeling procedures to determine the $PM_{2.5}$ emission limit for PRGS that will comply with the $PM_{2.5}$ NAAQS and protect public health.

VDEQ is currently preparing a State Operating Permit ("SOP") for PRGS in its current five-stack configuration, as well as accepting public comment on a SOP for this facility in a proposed two-stack configuration. As you are well aware, 9 VAC 5-80-1180 standards and conditions for granting permits, applies to both of these permit proceedings, i.e., that:

"no permit shall be granted pursuant to this article unless it is shown to the satisfaction of the board that…the source shall be designed, built and equipped to operate without preventing or interfering with the attainment or maintenance of any applicable ambient air quality standard and without causing or exacerbating a violation of any applicable ambient air quality standard..."

It is only within an air quality modeling simulation, as differentiated from the practice of air monitoring, that an applicant can demonstrate that their source will not cause or contribute to a violation of NAAQS, under all potential worst-case conditions and in all areas to which the public has access. This letter presents written policy documents describing ambient air quality modeling procedures that other states are using, and provides examples of permit applications and draft permits that respond to those source permitting requirements to establish $PM_{2.5}$ emissions limits that protect the $PM_{2.5}$ NAAQS.

The federal Guideline on Air Quality Models, 40 CFR Part 51, Appendix W, prescribes procedures for air quality modeling to respond to the "need for consistency in the application of air quality models for regulatory purposes." [1] Mirant's current analysis correctly includes both the filterable and condensable components of PM_{10} within an ambient air quality analysis that applies a Guideline-approved model, i.e., AERMOD, and procedures to evaluate the maximum potential impacts of PM_{10} against the PM_{10} NAAQS.

However, for $PM_{2.5}$, also made up of filterable and condensable components, Mirant does not provide any such impact analysis. VDEQ has asserted that the PM_{10} compliance demonstration wholly satisfies $PM_{2.5}$ NAAQS compliance, an approach that VDEQ maintains is supported by draft guidance (currently in the public comment phase) and described in a U.S. EPA memorandum titled "Implementation of New Source Review Requirements in PM-2.5 Nonattainment Areas," (April, 2005),[2] i.e., the "Page memorandum." However, the Page memorandum defines an approach that is only relevant to a different type of permit proceeding, i.e., New Source Review ("NSR"), which does not apply to the current SOP proceeding for PRGS. Furthermore, the policy discussed in this memorandum is deficient and outdated because it regulates one pollutant through review of another that has distinctly different health effects and therefore different health-based exposure criteria. In 1997, when the $PM_{2.5}$ standard was first promulgated, and in 2006 when it was significantly tightened, U.S. EPA was responding to the large body of scientific evidence distinguishing the health effects of fine particulate matter (also described as inhalable) from those of coarse particulate matter (also described as

[1] "Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule," Federal Register, November 9, 2005. Available at http://www.epa.gov/scram001/guidance/guide/appw_05.pdf.

[2] Stephen D. Page, Office of Air Quality Planning and Standards, U.S. EPA, April, 2005.

thoracic).[3] Even when the Page memorandum was drafted in 2005, it lacked the support of any analysis specifically evaluating its efficacy for protecting the $PM_{2.5}$ NAAQS.[4] Now, in 2008, with the recent significant tightening of the $PM_{2.5}$ standard, the approach only moves further from accomplishing protection of the $PM_{2.5}$ NAAQS.

Additionally, the PRGS is requesting a SOP while the Page memorandum applies to NSR proceedings. However, even if one were to accept that this draft NSR guidance applies in this non-NSR proceeding, Alexandria believes VDEQ has misinterpreted the Page memorandum. The Page memorandum unequivocally states that in a $PM_{2.5}$ *nonattainment* area, a PM_{10} *nonattainment* area program applies.[5] As you are aware, a nonattainment area NSR triggers requirements for the applicant to obtain offsets through emission reductions from, or retirement of, other nearby sources, apply lowest achievable emission rate ("LAER") control technology, and demonstrate that the source will not contribute to the non-attainment status of the region or create a new projected $PM_{2.5}$ nonattainment area to meet the latter criteria, the applicant can show that the source's impacts fall below the significant impact levels ("SIL").[6] Not only does Mirant ignore LAER or offset requirements, its ambient air quality modeling analysis only includes an evaluation against the full PM_{10} NAAQS, instead of the PM_{10} SIL. This misinterpretation of the PM_{10}-as-surrogate approach allows Mirant, with deleterious effect as the results below show, to treat the nonattainment area as though it were attainment.

Other States Require Standard Modeling to Establish $PM_{2.5}$ Permit Limits

In stark contrast to VDEQ's assertion regarding $PM_{2.5}$ modeling that "it would be extremely difficult for any source to show compliance using the modeling techniques applied for other criteria pollutants,"[7] several other states which also have $PM_{2.5}$

[3] This distinction has been iterated within the recent promulgation of the Clean Air Fine Particle Implementation Rule which "notif[ies] sources that…EPA will no longer accept the use of PM_{10} emission information as surrogate for $PM_{2.5}$ emissions information given that both pollutants are regulated by a National Ambient Air Quality Standard and therefore are considered regulated air pollutants." See "Clean Air Fine Particle Implementation Rule," 40 CFR Part 51, Federal Register, April 25, 2007.

[4] Correspondence with Lynne Hutchinson, Office of Air Quality Planning and Standards, U.S. EPA, December 20, 2007. In a request for records relating to public comment on the Page memorandum and for documentation of analysis used in determining if this guidance would provide sufficient protection of the $PM_{2.5}$ NAAQS, Ms. Hutchinson replied that U.S. EPA "did not request comment before issuing this guidance" and also "did not conduct additional studies or analysis in prepar[ing] this document…[i]nstead we relied on existing scientific evidence of the composition of PM2.5 and PM10 emissions."

[5] See page 2 of Page memorandum, under "What applies in PM2.5 nonattainment areas?" The memorandum states that "using the surrogate PM-2.5 nonattainment major NSR program, States should assume that a major stationary source's PM-10 emissions represent PM-2.5 emissions and regulate these using either Appendix S or the State's SIP-approved nonattainment major NSR program for PM-10."

[6] "40 CFR Parts 51 and 52 Prevention of Significant Deterioration (PSD) for Particulate Matter Less Than 2.5 Micrometers (PM2.5)—Increments, Significant Impact Levels (SILs) and Significant Monitoring Concentration (SMC)"; Proposed Rule, Federal Register, Friday, September 21, 2007. Section VI, Significant Impact Levels, states that "[w]here a PSD source may have an impact on an adjacent nonattainment area, the PSD source must still demonstrate that it will not cause or contribute to a violation of the NAAQS in the adjacent area. This demonstration may be made by showing that the emissions from the PSD source alone are below the significant impact levels…"

[7] "Virginia Department of Environmental Quality (DEQ) Technical Review of the Air Quality Analyses in Support of the Merged Stack (2-Stack) Comprehensive State Operating Permit for the Mirant—Potomac River Generating Station

nonattainment regions have developed policies, and have issued permits to facilities under these policies, that require the application of standard modeling techniques for determining the source's $PM_{2.5}$ emission limits that are protective of $PM_{2.5}$ NAAQS. Moreover, VDEQ's failure to apply these available modeling techniques on the basis of inconvenience not only represents a dereliction of their duty to protect NAAQS, it also ignores the fact that emission reductions, such as those achieved by installation of pollution controls, are often required to meet NAAQS. Alexandria's analysis, presented later in this letter, shows the emission rates required to meet $PM_{2.5}$ NAAQS, which can be achieved by installation of state-of-the-art pollution controls, such as baghouses.

New York, New Jersey and Connecticut have developed policies by which applicants use standard modeling techniques to propose permitted $PM_{2.5}$ emission limits that will not cause or contribute to an exceedance of the $PM_{2.5}$ NAAQS. The following guidance documents delineate their recommended modeling approaches and are attached to this letter for your perusal.

1. Attachment A: "Revised Interim PM-2.5 (Fine Particulate) Permitting and Modeling Procedures," State of New Jersey, Department of Environmental Protection, Division of Air Quality.

2. Attachment B: "CP-33 Assessing and Mitigating Impacts of Fine Particulate Matter Emissions," New York State Department of Environmental Conservation, DEC Policy.[8]

3. Attachment C: "DAR-10 / NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis."[9] Attachment E of this NYSDEC document states that in $PM_{2.5}$ nonattainment areas "there are two basic modeling requirements… 1) demonstration of insignificant impacts, and 2) a net air quality benefits analysis." See also Table 1 of this document titled "EPA Recommended Modeling Procedures for Terrain Setting, Pollutants, Source Types, and Dispersion Conditions" that lists AERMOD and ISC3[10] as preferred refined models for direct emissions of $PM_{2.5}$.

4. Attachment D: "CT DEP Interim $PM_{2.5}$ New Source Review Modeling Policy and Procedures."

Included below are several examples of applications describing the exact procedures employed in simulating $PM_{2.5}$ emissions (filterable plus condensable) within AERMOD to assess $PM_{2.5}$ impacts against the $PM_{2.5}$ NAAQS. Note that in the case of the $PM_{2.5}$ impacts analysis prepared by TRC for the proposed Kimberly-Clark Corporation's combined heat

(PRGS)," Mike Kiss, Coordinator – Air Quality Assessments Groups to Terry Darton, Air Permit Manager, Northern Regional Office, December 21, 2007.

[8] http://www.dec.ny.gov/docs/air_pdf/cp_33.pdf

[9] http://www.dec.ny.gov/docs/air_pdf/dar10.pdf

[10] NYSDEC notes in this table that after 12/9/06 ISC3 is no longer acceptable and that AERMOD is the acceptable model. As of 12/9/06, the 1-year grandfathering period for ISC3 expired so that AERMOD, which replaced ISC3, is the preferred regulatory model under 40 CFR 51, Appendix W.

and power project, AERMOD was used to demonstrate that the "proposed operation of the project will produce insignificant impacts that will not interfere with the attainment and maintenance of compliance with the … NAAQS." Several permits are also included that show the corresponding $PM_{2.5}$ emission limits.

1. Attachments E-1 and E-2: "Modeling Report in Support of the Kimberly-Clark Corporation – New Milford Mill Combined Heat and Power Project," Prepared by TRC, Windsor, Connecticut, July, 2007.

2. Attachment E-3: "New Source Review Permit to Construct and Operate a Stationary Source," Draft, Kimberly-Clark Corporation, July, 2007 (copy of final permit has been requested).

3. Attachment F: "Plainfield Renewable Energy LLC, Application for Air Permit to Construct and Operate, CT DEP Application No. 200602226, Revised $PM_{2.5}$ Emission Rates and NAAQS Compliance Demonstration," July 23, 2007, with draft air permit attached (copy of final permit has been requested).

4. Attachment G: Air Quality Impact Analysis, Plainfield Renewable Energy Project, In Support of CTDEP Application No. 200602226, Prepared by M.I. Holzmann & Associates, LLC, December, 2006.

Alexandria requests the SAPCB and VDEQ to require a full $PM_{2.5}$ compliance demonstration from Mirant PRGS that uses the same (or similar) technical procedures that other states have found to be sound and supportable for the purposes of establishing $PM_{2.5}$-NAAQS-protective emission limitations for all of the scenarios for which PRGS requests operation.

$PM_{2.5}$ Impacts for PRGS Using the AERMOD Approach of Other States

Alexandria has applied the same approach used in these other states, and with Mirant's own modeling files, using AERMOD for several of the requested operational scenarios to determine how $PM_{2.5}$ impacts from the PRGS compare to the $PM_{2.5}$ NAAQS.[11] Results for one of the worst-case operational scenarios are shown below.

[11] Procedures used in applying Mirant's AERMOD files to determine the facility's impacts for these operational scenarios was described in the document "Procedures Applied in Determining PRGS's Maximum PM2.5 Impacts for only Limited Scenarios," attached in an email relayed by M. Barrett to M. Kiss on October 26, 2007.

PRGS's Modeled Primary $PM_{2.5}$ Impacts (Stacks Only)

Modeled Scenario		Stack Configuration	Maximum 8^{th}-high 24-Hr Impact ($\mu g/m^3$) [(a)]	Monitored Background[(b)] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	24-Hr NAAQS ($\mu g/m^3$)
3 Base	Boilers 3, 4 & 5 at min load, 24 hours/day	Existing 5-stack	24.5	34.1	**58.6**	35

(a) For five years of modeling, assuming $PM_{2.5}$ emissions are equal to the rate allowed by the 5-stack SOP, i.e., 0.055 lb/MMBtu. The listed impact is the highest of the 3-year averages of eighth-highest (98^{th} percentile) AERMOD result derived using Mirant's modeling files posted on VDEQ's ftp site with no change, except to allow the calculation of the 8^{th} highest impacts.

(b) Three-year average of the 8^{th} highest daily observation for years 2004 – 2006 from VDEQ's Aurora Hills monitor. Yearly data provided by Mr. Michael Kiss of VDEQ.

These results show that even without consideration of the impacts from (1) fugitive $PM_{2.5}$ emissions from the PRGS's coal and ash handling operations; (2) the effect of secondary $PM_{2.5}$ formation due to precursor emissions from PRGS (which is expected to contribute a relatively small impact at close-in receptors); and (3) $PM_{2.5}$ emissions from other nearby interacting sources that were evaluated in the PM_{10} impacts analysis, the predicted $PM_{2.5}$ impacts far exceed the $PM_{2.5}$ NAAQS.[12]

The table below shows the calculated $PM_{2.5}$ emission rates at which the PRGS's stacks would not cause or contribute to an exceedance of the NAAQS, i.e., the impacts at these emission rates would be below the $PM_{2.5}$ SIL proposed by U.S. EPA (September 21, 2007). AERMOD results for $PM_{2.5}$ indicate that compliance with the 24-hour NAAQS will substantially assure compliance with the annual NAAQS. Alexandria requests the SAPCB and VDEQ to require a complete analysis of all operating scenarios and fugitive sources for the purpose of stipulating $PM_{2.5}$ emission limits in the SOP that are protective of the $PM_{2.5}$ NAAQS.

Calculated Stack $PM_{2.5}$ Emission Limits Necessary for NAAQS Compliance

Proposed Limit - 5-stack SOP (lb/MMBtu)	Modeled $PM_{2.5}$ Impact at Proposed SOP Limit[(a)] ($\mu g/m^3$)	US EPA's Proposed $PM_{2.5}$ SILs ($\mu g/m^3$)	Calculated $PM_{2.5}$ Limit for Impacts to be Below SIL (lb/MMBtu)
0.055	24.5	5.0	0.011
		4.0	0.009
		1.2	0.003

(a) Results for "**3 Base**" case, assuming Boilers 3, 4 and 5 running at minimum load for 24 hours per day, i.e., one of the worst-case scenarios. All scenarios must be evaluated for a complete analysis.

PM CEMS Are Necessary for Compliance Assurance and Can be Implemented Now

While an air quality ambient impacts analysis using standard modeling techniques can determine PM_{10} and $PM_{2.5}$ emission limitations that are NAAQS-protective for the PRGS, a means of continuously monitoring compliance with the stipulated emission limitations must be installed and operated by the facility. The continuous opacity monitors that are

[12] Note that $PM_{2.5}$ monitoring results for the period of November, 2006 to July, 2007 show several days where measured impacts exceeded the 24-hour level of the PM2.5 NAAQS while concurrently exceeding regionally monitored levels.

currently used by PRGS are insufficient to assure such compliance. Not only is the proposed 20% / 30% window of allowed opacity (in Paragraph 32, Visible Emission Limit of the draft five-stack SOP) far too relaxed given the ability of PRGS's control equipment to maintain a historical opacity average of less than 7%,[13] such a relaxed window allows continuous emissions of particulate matter at levels on the order of twice the proposed permitted rate.[14] As such, compliance with the opacity limits will not assure compliance with the mass emission limits.

While current PM CEMS can measure only total filterable particulate matter, through semi-annual stack testing PRGS can establish and verify a relationship between total particulate matter and its sub-components that, in turn, could be relied upon to monitor continuous compliance with PM_{10} and $PM_{2.5}$ emission limits. PM CEMS are in use now at numerous electrical generating and manufacturing facilities for compliance purposes, as listed below.

Partial List of Sources Currently Using PM CEMS

Source	PM CEMS Installation Date	PM CEMS Technology
Tampa Electric – Big Bend Unit 4	Feb 2002	Beta Attenuation
Dominion Generation – Mt. Storm Units 1 & 2	Jul 2004	Beta Attenuation
We Energies - Oak Creek Units 5 & 6	Jan 2005	Beta Attenuation
We Energies - Pleasant Prairie Units 1 & 2	Sep 2006	Beta Attenuation
Western Kentucky Energy - Henderson Unit 2	Aug 2005	Beta Attenuation
Western Kentucky Energy - Henderson Unit 1	Feb 2007	Beta Attenuation
Kentucky Utilities Company- Ghent Station		Light Scatter
Kentucky Utilities Company- Mill Creek Station		Light Scatter
Minnkota Power Coop – M.R. Young Unit 2	Jul 2007	Beta Attenuation
DOE Oak Ridge TSCA Incinerator	Dec 2004	Beta Attenuation
Rayonier Pulp Mill - Recovery Boiler	Apr 2003	Beta Attenuation
Kennecott Utah Copper – Primary Smelter	Dec 2005	Beta Attenuation
Sunoco Refinery – FCCU/CO Boiler Stack	Apr 2007	Beta Attenuation

Alexandria requests the SAPCB and VDEQ to stipulate that Mirant PRGS implement and operate PM CEMs on each of the stacks within a reasonable time frame, i.e., three to six months, from the date of permit issuance.

Alexandria urges the Board and VDEQ to exercise their duties in stipulating a scientifically sound approach as other states have done to determine a proper $PM_{2.5}$ permit emission limit for PRGS that will comply with the $PM_{2.5}$ NAAQS and protect public health.

13 "Comparison of 2005(Pre-Trona) Opacity to 2006(With Trona) Opacity at Potomac River," electronic mail communication from Mr. David Cramer of Mirant, May, 2007.

14 Results of measured particulate emissions in pound per million Btu versus opacity, as reported in and "Current Knowledge of Particulate Matter (PM) Continuous Emission Monitoring," EPA-454/R-00-039, September, 2000.

Should you have any questions or comments, please do not hesitate to contact William Skrabak at (703) 519-3400, ext. 163.

Sincerely,

William J. Skrabak

William Skrabak
Chief, Division of Environmental Quality
Department of Transportation & Environmental Services
City of Alexandria

Reviewed and approved for technical content by,

MJindal

Malay Jindal
MACTEC Federal Programs, Inc.

Maureen Barrett

Maureen Barrett, P.E. (Massachusetts)
AERO Engineering Services

cc: The Honorable James P. Moran, w/o attachments
The Honorable Tim Kaine, w/o attachments
The Honorable L. Preston Bryant, Jr. , w/o attachments
The Honorable Richard L. Saslaw, Senate of Virginia, w/o attachments
The Honorable Patricia S. Ticer, Senate of Virginia, w/o attachments
The Honorable Mary Margaret Whipple, Senate of Virginia, w/o attachments
The Honorable Bob Brink, Virginia House of Delegates, w/o attachments
The Honorable Adam P. Ebbin, Virginia House of Delegates, w/o attachments
The Honorable David L. Englin, Virginia House of Delegates, w/o attachments
The Honorable Al Eisenberg, Virginia House of Delegates, w/o attachments
The Honorable Brian J. Moran, Virginia House of Delegates, w/o attachments
The Honorable Mayor and Members of City Council, City of Alexandria, w/o attachments
James K. Hartmann, City Manager, City of Alexandria, w/o attachments
Richard Baier, Director of T&ES, City of Alexandria
Ignacio B. Pessoa, City Attorney, City of Alexandria
John B. Britton, SHSL
Richard Weeks, VDEQ
Michael Kiss, VDEQ

Attachment A

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

Division of Air Quality
P.O. Box 027
Trenton, NJ 08625

MEMORANDUM

TO: BOP, BPP, and BTS Supervisors May 11, 2007

FROM: John Preczewski, Assistant Director
Air Permitting Element

SUBJECT: Revised Interim PM-2.5 (Fine Particulate) Permitting and Modeling Procedures

The purpose of this memo is to amend the Bureau of Technical Service's January 23, 2006 memo on PM-2.5 nonattainment New Source Review (NSR) procedures in New Jersey. These revised procedures will be used until New Jersey adopts PM-2.5 specific nonattainment NSR provisions, or until further revision of these interim procedures is necessary based on new EPA guidance or implementation rules. Facilities subject to this interim guidance are the following:

a. Any **new** facility that has the potential to emit equal to or exceed 100 TPY of PM-10 or PM2.5 emissions,

b. Any **existing** facility that has the potential to emit equal to or exceed 100 TPY of PM-10 or PM-2.5 emissions that is proposing net emissions increase of 15 TPY or more, and

c. Any **Subchapter 18 affected facility** that is proposing net emissions increase of 15 TPY or more of PM-10 or PM-2.5 emissions.

The procedures described in this memo apply guidance given in the April 5, 2005 memo from Steve Page (Director of EPA's Office of Air Quality Planning and Standards Director) to the largest sources of PM-2.5. The large PM-2.5 sources (100 tons/yr or more) will follow guidance contained in Section III.a of this memo.

Smaller PM-2.5 sources at major facilities where another air contaminant exceeds the major source thresholds specified in N.J.A.C.7:27-18 (Emissions Offset Rule) with a PM-10 net emission increases sufficient to trigger N.J.A.C. 7:27-18 (15 tons/yr) will follow a somewhat different set of procedures given in Section III.b of the memo.

These procedures are designed to avoid two possible scenarios:

1) creation of new PM-2.5 NAAQS violations in areas where the monitored PM-2.5 levels are currently below the NAAQS,

2) significant ambient impacts in areas where monitored PM-2.5 levels are currently above the NAAQS.

As of the date this memo is signed, applicable applications that are not out for public comment (where one will occur) or do not have a proposed permit will need to address the attached interim PM-2.5 permitting/modeling procedures.

C: William O'Sullivan (Director, DAQ)

Revised Interim PM-2.5 (Fine Particulate) Permitting and Modeling Procedures

I. Background

The PM-2.5 NAAQS was originally promulgated by EPA in July 1997, and later revised in December 2006.

Pollutant	NAAQS	Averaging Times	Secondary Stds.
Particulate Matter ($PM_{2.5}$)	15.0 μg/m^3	Annual [a]	Same as Primary
	35 ug/m^3	24-hour [b]	Same as Primary

a. To attain this standard, the 3-year arithmetic mean of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.
b. To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations must not exceed 35 ug/m^3.

The following 13 New Jersey counties are currently designated nonattainment for the PM-2.5 NAAQS: Bergen, Burlington, Camden, Essex, Gloucester, Hudson, Mercer, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union (see attached Figure 1).

Interim PM-2.5 significant impact levels (SILs) were endorsed by the NESCAUM Air Directors on December 8, 2006. The interim PM2.5 SILs are discussed in the document entitled *"NESCAUM Technical Guidance on Significant Impact Levels (SILs) for PM-2.5"* (www.nescaum.org/topics/ permit-modeling/). Consistent with this guidance, the following interim Class II PM-2.5 SILs will be applied in the evaluation of both Appendix S and Subchapter 18 sources in New Jersey:

PM-2.5 Interim Significant Impact Levels
Annual NAAQS - 0.30 ug/m^3,
24-hour average NAAQS – 2.00 ug/m^3.

This interim guidance does not require a higher than 1:1 offset ratio. The higher offset ratio and distance requirements listed in N.J.A.C.7:27-18 for PM-10 are not being applied to PM-2.5 because PM-2.5 concentrations are more regional in nature than PM-10. Offsets obtained anywhere in the nonattainment area at a ratio of 1:1 are assumed to provide a net air quality benefit.

II. Interim PM-2.5 Permitting Procedures

1. Determination of PM-2.5 Emissions

The applicant may either assume that PM-2.5 emissions are equivalent to PM-10 emissions or, if supporting data exists, quantify the portion of emissions that are PM-2.5. Condensible particulate emissions must be included.

For the interim period, applicability to PM-2.5 nonattainment NSR will be based on direct PM-2.5 emissions. Precursors will not be included in the applicability determination.

2. Netting Procedures

PM-2.5 nonattainment NSR applicability determinations will use the netting procedures described in N.J.A.C. 7:27-18.7 (Determination of a net emission increase or a significant net emission increase).

For determination of the contemporaneous period, only direct PM-2.5 emission changes since April 5, 2005 should be included in the netting equation unless a source will be using banked emission offsets generated before April 5, 2005. If a source uses banked offsets generated before April 5, 2005, the contemporaneous period specified in N.J.A.C. 7:27-18.1 will be used.

3. Compliance Plan

New equipment with PM-2.5 or PM-10 emissions of 100 tons/year or more, or existing equipment with PM-2.5 or PM-10 emissions of 100 tons/year or more with a PM-2.5 or PM-10 net emissions increase of 15 tons/year or more shall include a PM-2.5 emission rate for fuel specific operating scenarios at the equipment level in their Title V permit. At the equipment level they will have a requirement for PM-2.5 stack testing in their compliance plan. Sources that specify PM-2.5 emissions equal to PM-10 emissions need only stack test for PM-10.

4. Applicability of III.A or III.B

Sources with PM-2.5 emission increases that qualify for both III.A and III.B below should follow the procedures of III.A.

III.A New Major PM-2.5 sources (100 tons/year or more) or Existing Major PM-2.5 Sources (100 tons/year or more) with a Proposed Project that has PM-2.5 Net Emissions Increase of 15 tons/year or More

The procedures for these projects are based on the April 5, 2005 EPA memo from Steve Page, Office of Air Quality Planning and Standards Director, entitled *Implementation of New Source Review Requirements in PM2.5 Nonattainment Areas*. This memo outlines the requirements for the permitting of major PM-2.5 sources in designated non-attainment areas.

1. <u>Located in a Designated PM-2.5 Nonattainment Area</u>

(a) Apply Lowest Achievable Emission Rate (LAER) controls [see N.J.A.C. 7:27-18.3(b)(1)]. PM-10 LAER controls are acceptable for PM-2.5.

(b) Obtain PM-2.5 emission reductions (offsets) from existing particulate sources [see N.J.A.C. 7:27-18.3(c)(1)]. The source providing the emission offset must be located in the same PM-2.5 nonattainment area (Philadelphia/Camden/Wilmington or New York/Northern New Jersey/Connecticut) as the permitted source. The emissions offset ratio must be at least 1:1, unless the applicant is able to demonstrate a positive net air quality benefit[1] with a less than 1:1 emission offset ratio. In addition to considering offsets from existing stationary sources, applicants are encouraged to investigate possible PM-2.5 reductions from mobile and other ground-level PM-2.5 sources. Funding retrofit emission controls to on- road or off-road diesel vehicles or electrification of bays at a truck stop to reduce diesel idling emissions are examples of possible offset sources. A portion of banked particulate emission reductions credits may be used as PM-2.5 offsets if the PM-2.5 fraction can be reasonably established and other offset requirements met.

(c) Certify all other sources in the state are in compliance[see N.J.A.C. 7:27-18.3(b)2 for additional details].

(d) Submit an alternatives analysis [see N.J.A.C. 7:27-18.3(c)2 for additional details].

2. <u>Located in a Designated PM-2.5 Attainment Area and Causing a Significant Impact in a Designated PM-2.5 Nonattainment Area</u>

Air quality modeling will be conducted to determine if the proposed PM-2.5 net emissions increase will cause a significant impact in a designated PM-2.5 nonattainment area. If predicted concentrations exceed the SILs in the nonattainment area, the source must comply with the requirements in N.J.A.C. 7:27-18.3(b) and (c) (LAER, Offsets, compliance, and alternative analysis), which are discussed in Item 1 above.

3. <u>Located in a Designated PM-2.5 Attainment Area and Causing a New PM-2.5 Nonattainment Area</u>

Air quality modeling will be conducted to determine if the proposed PM-2.5 net emissions increase will cause a new modeled PM-2.5 nonattainment area. Inclusion of other nearby large PM-2.5 sources in the modeling if needed to more accurately define background PM-2.5 levels will be determined on a case-by-case basis.

May 11, 2007

[1] N.J.A.C. 7:27-18.1 defines a net air quality benefit as a net decrease in the ambient concentration of the respective criteria pollutant for the air contaminant in the area affected by a proposed emissions increase of an air contaminant.

If the modeled PM-2.5 impact plus representative background exceeds the 24-hour or annual PM-2.5 NAAQS, then a determination is made whether the source's contribution to the NAAQS violation exceeds the PM-2.5 SIL for the relevant averaging time. If so, the source must take steps to eliminate the violation or reduce its impact below the SIL. Possible strategies for reducing its PM-2.5 impact include reducing emissions, increasing stack height or obtaining emission reductions (offsets) from existing sources. The emission offsets and other mitigation measures secured must be modeled to verify they result in the elimination of the predicted violation or reduction in the source's impact to below the PM-2.5 SIL.

III.B *Subchaper 18 Major Sources with a Proposed Project that has Net Emissions Increase of PM-10 (PM-2.5) of 15 tons/year or More*

As defined in N.J.A.C. 7:27-18's applicability section, if a source is major for one criteria pollutant, it is considered major for all. Therefore, PM-2.5 nonattainment NSR would apply to all proposed projects with a significant net emissions increase in PM-10 (PM-2.5). For these projects, emission offsets may be used to reduce its modeled impact below the SILs which would avoid the other nonattainment NSR requirements.

The major source thresholds as defined in Subchapters 18 and 22 and the significant emission increases levels defined in Subchapter 18 are listed below.

Air Contaminants	Major Facility Thresholds	Major Mod. Thresholds
Carbon monoxide	100 TPY	100 TPY
PM-10	100 TPY	15 TPY
TSP	100 TPY	25 TPY
Sulfur dioxide	100 TPY	40 TPY
Oxides of nitrogen	25 TPY	25 TPY
VOC	25 TPY	25 TPY
Lead	10 TPY	0.6 TPY

The interim PM-2.5 significant net emissions increase of 15 tons/year is based on the current PM-10 significance level of 15 tons/year.

1. Located in a Designated PM-2.5 Nonattainment Area with Nearby Representative Monitored Values Above the NAAQS

Air quality modeling will be conducted for the proposed greater than 15 TPY PM-2.5 net emissions increase. If the source's modeled PM-2.5 impact is above the PM-2.5 SIL for the relevant averaging time (24-hour or annual), the source may reduce its ambient impact to less than the SIL which would avoid triggering the nonattainment rule requirements. Possible methods of reducing its impact include reducing PM-2.5 emissions, increasing stack height, or obtaining emission offsets to reduce the modeled impact below the SILs. If impacts remain above the SILs, all nonattainment requirements described in III.A.1 must be met (LAER, 1:1 offsets, etc).

May 11, 2007

2. <u>Sources Located in a Designated PM-2.5 Attainment or Nonattainment Area with Nearby Representative Monitored Values Below the NAAQS</u>

These procedures are designed to avoid the creation of new PM-2.5 NAAQS violations in both attainment and nonattainment areas where the monitored PM-2.5 levels are below the NAAQS. Air quality modeling will be conducted for the proposed PM-2.5 net emissions increase. Inclusion of other nearby large PM-2.5 sources in the modeling, if needed to more accurately define background PM-2.5 levels, will be determined on a case-by-case basis.

If the modeled PM-2.5 impact plus representative background exceeds the 24-hour or annual PM-2.5 NAAQS, then a determination is made whether the source's contribution to the NAAQS violation exceeds the PM-2.5 SIL for the relevant averaging time. If so, the source must take steps to eliminate the violation or reduce its impact below the SIL. Possible strategies for reducing its PM-2.5 impact include reducing emissions, increasing stack height or obtaining emission reductions (offsets) from existing sources. The emission offsets and other mitigation measures secured must be modeled to verify they result in the elimination of the predicted violation or reduction in the source's impact to below the PM-2.5 SIL.

IV. Interim PM-2.5 Modeling Procedures

1. <u>Modeling Direct and Precursor Emissions</u>

PM-2.5 modeled annual and 24-hour ambient impacts will generally be based on direct PM-2.5 emissions. The contribution from secondary PM-2.5 (sulfates and nitrates) will be included in the nonattainment area model evaluation where the proposed emission increases of either sulfur dioxide or nitrogen oxides exceeds 250 tons per year.

2. <u>Background PM-2.5 Air Quality</u>

A NJDEP or neighboring state's PM-2.5 monitor will be selected that represents background PM-2.5 in the vicinity of the source's impact area. The annual background PM-2.5 value should be based on the average of the latest 3-years of available data. The 24-hour background PM-2.5 value should be based on the average of the 98th percentile 24-hour value measured over the latest 3-years of available data. The NJDEP 2003-2005 PM-2.5 monitoring data is presented in the attached Table 1.

3. <u>Calculation of Impacts for Comparison to SILs</u>

a. Initially, the maximum annual PM-2.5 concentration predicted at any receptor during the five-years of modeling should be compared to the annual SIL (0.30 ug/m^3) to determine if the source has a significant impact. If the predicted impact is above the annual PM-2.5 SIL, the applicant has the option of calculating the maximum <u>three-year</u>

average PM-2.5 prediction at any receptor and comparing that value to the annual PM-2.5 SIL.

b. Initially, the maximum 24-hour PM-2.5 concentration predicted at any receptor during the five-years of modeling should be compared to the 24-hour SIL (2.0 ug/m^3) to determine if the source has a significant impact. If the predicted impact is above the 24-hour PM-2.5 SIL, the applicant has the option of calculating the maximum 24-hour PM-2.5 prediction at any receptor averaged over three-years and comparing that value to the 24-hour PM-2.5 SIL.

4. Multisource Modeling

On a case-by-case basis, other PM-2.5 sources in the vicinity of the source (≤10 km) may be included in the modeling analysis. This should be done if the proposed source impact is above the SILs and the selected PM-2.5 background monitor does not adequately reflect existing PM-2.5 concentrations in the area. Sources with PM-10 emission limits will be converted to PM-2.5 emissions using AP-42 and other available information.

5. Calculation of Impacts for Comparison to NAAQS

a. Initially, the PM-2.5 annual average impact should be calculated using the maximum annual PM-2.5 concentration predicted at any receptor during the five-years of modeling. This value should be added to the 3-year average annual background value from a representative PM-2.5 monitor and compared to the annual NAAQS. If a violation of the annual PM-2.5 NAAQS of 15 ug/m^3 is predicted, the modeled annual PM-2.5 should be recalculated as the maximum three-year average PM-2.5 prediction at any receptor. This value should be added to the representative 3-year average annual background value and compared to the annual NAAQS.

b. Initially, the PM-2.5 24-hour impact should be calculated as the maximum 8th high 24-hour average PM-2.5 prediction at any receptor during the five-years of modeling. This value should be added to the 3-year average 98th percentile 24-hour background value from a representative PM-2.5 monitor and compared to the 24-hour NAAQS. If a violation of the 24-hour PM-2.5 NAAQS of 35 ug/m^3 is predicted, then the 24-hour PM-2.5 total impact should be recalculated as the 3-year average of maximum 8th high 24-hour average PM-2.5 predictions at any receptor. This value should be added to the representative 3-year average 98th percentile 24-hour background value and compared to the 24-hour NAAQS.

Table 1.
New Jersey Background PM-2.5 Concentrations [a]

City	County	2003-2005 98th Percentile 24-Hour Avg. (ug/m³)	2003-2005 Annual Average (ug/m³)
Atlantic City	Atlantic Co	29.2	11.6
Fort Lee	Bergen Co	**36.8**	13.3
Camden Lab	Camden Co	**38.7**	14.7
Pennsauken	Camden Co	**36.6**	13.8
Newark – Willis Center	Essex Co	**38.4**	13.9
Union City	Essex Co.	**44.3** [b]	**17.4** [b]
Gibbstown	Gloucester Co	32.2	13.4
Jersey City	Hudson Co	**40.6**	14.6
Trenton	Mercer Co	**35.8**	13.0
Washington Crossing	Mercer Co	32.0	11.7
New Brunswick	Middlesex Co	**38.1**	12.5
Chester	Morris Co.	33.0	10.6
Morristown	Morris Co	33.6	11.9
Toms River	Ocean Co	33.9	11.3
Paterson	Passaic Co	**37.1**	13.1
Elizabeth Lab	Union Co	**40.0**	**15.5**
Elizabeth	Union Co	**38.3**	13.8
Rahway	Union Co	**36.7**	13.3
Phillipsburg	Warren Co	34.8	13.1

a. Values in bold represent violations of the NAAQS.

b. Includes only one year of data (2005).

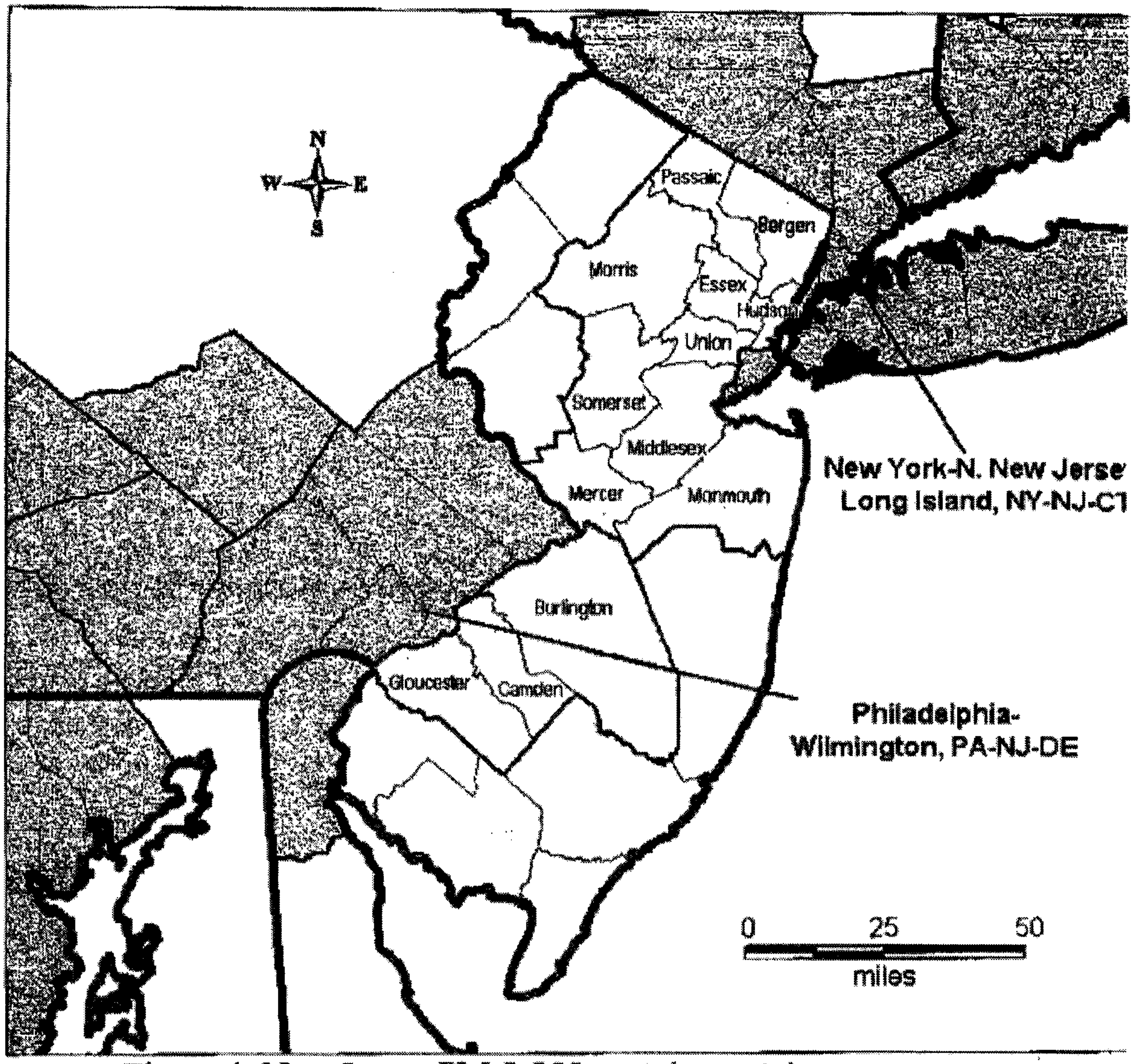
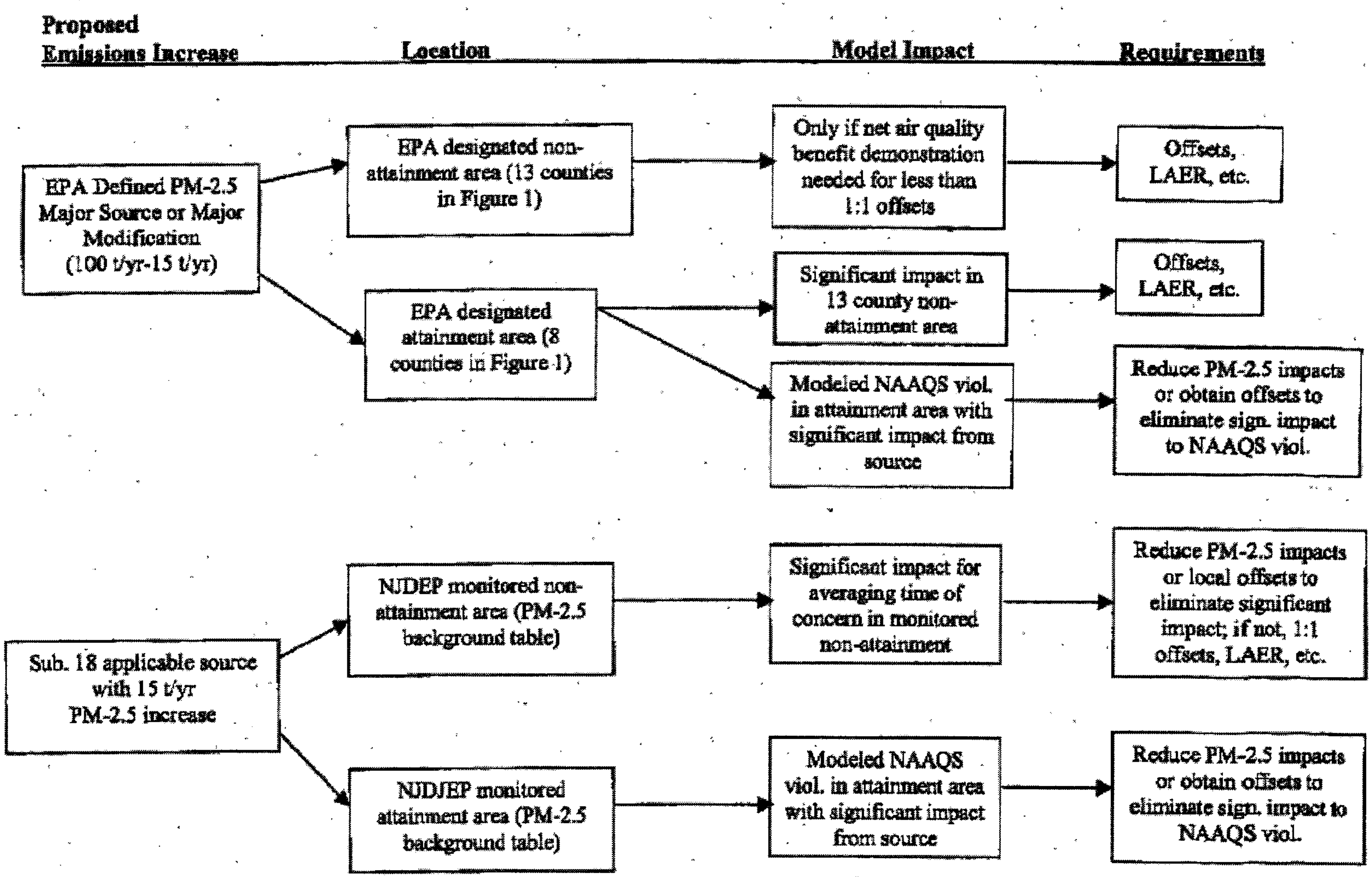


Figure 1. New Jersey PM-2.5 Nonattainment Areas

PM-2.5 NSR Flow Diagram



Attachment B

CP-33 / Assessing and Mitigating Impacts of Fine Particulate Matter Emissions	
New York State Department of Environmental Conservation **DEC Policy**	
Issuing Authority: Erin M. Crotty	
Date Issued: 12/29/2003	**Latest Date Revised:**

I. Summary: Certain projects regulated by the Department of Environmental Conservation have the potential to emit fine particulate matter, or $PM_{2.5}$, in quantities that could have a potential for significant adverse health and/or environmental impacts. The methodology set forth in this policy is consistent with the State Environmental Quality Review Act, represents a correct interpretation of its mandates, provides guidance on the project-specific assessment of fine particulate matter impacts and details when mitigation of such impacts may be necessary.

II. Policy: In the review of an application for a permit or major permit modification under the State Environmental Quality Review Act (SEQRA), Department staff shall evaluate the potential for significant adverse impacts resulting from the emission of fine particulate matter during the operation of the proposed project. If the operation of the proposed project will result in the emission of fine particulate matter above certain de minimis thresholds, Department staff shall require an air quality impact assessment of those emissions in accordance with the terms of this policy. If any required air quality impact assessment demonstrates that the $PM_{2.5}$ emissions of the proposed project will have a potentially significant adverse environmental impact, the Department, when lead agency, will require the applicant to prepare an environmental impact statement to assess the severity of the impacts, to evaluate alternatives, and to employ reasonable and necessary mitigation measures to minimize the $PM_{2.5}$ impacts of the source to the maximum extent practicable. In addition to providing guidance on how to determine whether a particular source's emissions (or emissions from sources associated with a specific project) will have a potentially significant adverse impact, this policy outlines possible ways to minimize those impacts. The Department shall use the procedures described in this policy in a manner consistent with existing federally-approved permitting programs, as such programs are revised or amended.

III. Purpose and Background: This policy provides interim direction to Department staff for evaluating the impacts of fine particulate matter emissions from proposed facilities that require one or more permits from the Department.[1] Specifically, this guidance provides a mechanism for complying with the provisions of the State Environmental Quality Review Act (SEQRA) as it relates to the impact of emissions of fine particulate matter. The

[1]The implementation of the United States Environmental Protection Agency's (EPA) final revised National Ambient Air Quality Standards (NAAQS) for fine particulate matter, or $PM_{2.5}$, is ongoing in New York State with the validation and review of the requisite ambient air quality monitoring data to establish which areas in the state are in attainment with the new standards. Until the Department proposes a State Implementation Plan to address compliance with the new $PM_{2.5}$ standards, EPA's Office of Air Quality Planning and Region II have indicated that the states have no further obligations under the Clean Air Act concerning $PM_{2.5}$. This policy seeks to address impacts from $PM_{2.5}$ emissions until such time as DEC adopts a State Implementation Plan covering $PM_{2.5}$.

guidance recommends methods for the assessment of the impacts of the emission of fine particulate matter that can serve as a reference for applicants preparing environmental assessments in support of an application for a permit, and details how Department staff should determine whether the $PM_{2.5}$ impacts of a particular project are significant. This policy shall apply until the $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) are fully implemented in the State of New York, and the policy will be revised from time to time to ensure consistency with the Department's implementation of its State Implementation Plan (SIP) under the federal Clean Air Act (CAA).

A. Particulate Matter Defined

"Particulate matter" (PM) is a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles (liquid droplets or solids) over a wide range of sizes. For regulatory purposes, particulate matter has been classified in terms of the particle's aerodynamic diameter. $PM_{2.5}$ is particulate matter with an aerodynamic diameter of 2.5 microns or less. PM_{10}, which is already regulated pursuant to federal and New York's permitting programs, includes all particulate matter with an aerodynamic diameter of 10 microns or less. Thus, $PM_{2.5}$ is, by definition, a subset of PM_{10}. In general, the term "fine particulate matter" is used to describe $PM_{2.5}$, while "coarse" particulate matter describes particulate matter with an aerodynamic diameter of greater than 2.5 microns and equal to or less than 10 microns.

B. History of PM Regulation

The body of research on the health impacts associated with elevated levels of particulate matter in the atmosphere dates back to the early 1970s and continues to grow. Over the past several decades, as new information has emerged regarding the health impacts associated with particulate matter emissions, the National Ambient Air Quality Standards for particulate matter were revised. Thus, in the 1980s, when a growing body of evidence indicated that particulate matter with an aerodynamic diameter of less than 10 microns was better correlated with specific health risks than that from particulate matter in general, the NAAQS for total suspended particulate was replaced by the NAAQS for PM10.

Similarly, an expanding body of research indicating that fine particulate matter, or $PM_{2.5}$, presents unique adverse health risks distinct from those associated with coarse particulate matter led to EPA's 1997 promulgation of the NAAQS standard for $PM_{2.5}$. In 1997, EPA revised the primary NAAQS for particulate matter to include two new $PM_{2.5}$ standards consisting of both long-term (annual) and short-term (24-hour) components. The annual standard was set at 15 micrograms per cubic meter ($\mu g/m^3$), and the 24-hour standard at 65 μg/m3.[2] These standards were established to meet the statutory dictate of the Clean Air Act that NAAQS be set with a margin of safety adequate to protect human health.

---

[2] A determination that a particular area is in attainment with the annual $PM_{2.5}$ standard is based on the three-year average of annual arithmetic mean concentrations from single or multiple community oriented monitors. Compliance with the 24-hour standard is to be based on the three-year average of the ninety-eighth (98th) percentile of the 24-hour concentrations of each population-oriented monitor in an area. In allowing for spatial averaging from monitors and relying on more robust three year averages, the EPA Administrator placed great weight on consistency with the underlying body of health effects evidence.

Elevated levels of $PM_{2.5}$ in the atmosphere have been linked to serious health conditions in humans. Exposure to $PM_{2.5}$ has been closely associated with increased hospital admissions and emergency room visits for heart and lung disease, increased incidence of respiratory disease, including asthma, decreased lung function and premature death. Sensitive groups that appear to be at greatest risk of such effects include the elderly, individuals with existing cardiopulmonary disease, and children.[3]

C. Direct $PM_{2.5}$ Emissions

$PM_{2.5}$ can be emitted as a primary pollutant directly from stationary and mobile sources. Sources of primary $PM_{2.5}$ include: stationary and mobile sources that burn fossil fuels; some industrial processes such as smelting; road and ocean salt; unpaved roads; construction and agricultural operations; and non-anthropogenic sources such as biogenic material and wild fires. Direct $PM_{2.5}$ emissions are comprised of such things as black carbon, metals, salt and soil dust, though the precise speciation of the emissions of $PM_{2.5}$ by a particular source is not yet possible.

D. Secondary $PM_{2.5}$ Formation

Fine particulate matter may also form in the ambient air, a process called secondary formation, from or as a direct result of the emission of $PM_{2.5}$ precursors from stationary and mobile sources. Secondary particles are formed from gases through chemical reactions in the atmosphere involving atmospheric oxygen, water vapor, ozone, hydroxyl and nitrate radical; and pollutants such as sulfur dioxide, nitrogen oxides and organic gases. Thus any given ambient particle may contain PM from many sources. Potential sources of secondary $PM_{2.5}$ precursors include: fossil fuel combustion sources; surface coating operations; certain industrial processes; and mining and agricultural operations. Secondary particulate formation is a long term process which can take hours and days and is, therefore, an important component of the long range transport contribution to ambient $PM_{2.5}$ levels in a particular area.

E. Limitations

The Department recognizes that the state of the science regarding direct $PM_{2.5}$ emissions and secondary formation continues to evolve. Whereas, in general, there is a consensus that elevated ambient levels of $PM_{2.5}$ present certain health risks, there is much less certainty about what sources contribute to ambient concentrations and how.[4] This uncertainty presents a challenge when assessing the impacts of the emissions from an individual source or multiple sources that make up a proposed project. The Department expects knowledge in these areas to grow considerably over the next few years as implementation of EPA's NAAQS for $PM_{2.5}$ proceeds. Until such time as DEC incorporates its plan for attainment of the $PM_{2.5}$ NAAQS within the State, this interim policy will provide guidance on the assessment and mitigation of potentially

[3]EPA maintains extensive information on particulate matter on its website at http://cfpub.epa.gov/ncea/cfm/partmatt.cfm.

[4]There is no scientific consensus, for example, as to the extent that $PM_{2.5}$ transport contributes to the ambient concentrations in a particular area of the country, or as to the precise causes of temporal and spatial variability in ambient $PM_{2.5}$ concentrations. There are numerous other areas of uncertainty in relation to project-specific $PM_{2.5}$ (and precursor) emissions and the impacts of those emissions on ambient concentrations.

significant $PM_{2.5}$ impacts using current knowledge.

IV. Responsibility:
The responsibility for interpretation of this document and periodic updating thereof shall reside with the Division of Air Resources.

V. Procedure:

A. Applicability

This policy shall apply when the Department is the lead agency conducting a SEQRA review of any project or action under 6 NYCRR Part 617. This policy should also guide Department staff in its participation in proceedings held pursuant to Article X of the Public Service Law.[5] This policy shall apply to the review of any project for which the Department has not issued a notice of complete application prior to the date this final policy is issued.[6]

B. Existing Ambient Air Concentrations

Assessment and minimization of $PM_{2.5}$ impacts shall be required for all projects that trigger identified thresholds, irrespective of the project's location. This interim policy does not distinguish between areas on the basis of monitored ambient $PM_{2.5}$ concentrations.[7] As such, observed ambient concentrations are not a determining factor in analyzing $PM_{2.5}$ impacts for the specific purposes defined hereunder.

C. Assessing the Project's Primary Emissions

The Department staff shall require that applicants for a permit hereunder quantify emissions of PM_{10} from a proposed project and assume that all measured or estimated PM_{10} emissions are

---

[5]The Board on Electric Generation Siting and the Environment is the final decision-making body in Article X cases. Department staff is a statutory party to all Article X proceedings and is required to provide expert testimony on areas within its expertise. See PSL §166(1)(b). This policy shall guide Department staff in that participation. Article X expired on January 1, 2003, but will continue to apply to projects with respect to which an application was filed prior to that date. See Chapter 519 of the Laws of 1992.

[6]This policy does not address regionally significant projects, as defined in 6 NYCRR Part 240. While the Department recognizes that such projects may impact air quality by affecting local PM2.5 ambient air quality concentrations, those impacts are most effectively addressed through the interagency consultation process established in Section 240.6.

[7]This policy takes the approach of treating all locations similarly irrespective of attainment status. Statewide $PM_{2.5}$ monitoring data are available for the full calendar years 2000, 2001 and 2002. Attainment designations are to be made after these data are validated and analyzed. The DEC $PM_{2.5}$ monitoring locations and data are available at http://www.dec.state.ny.us/website/dar/baqs/pm25mon.html.

$PM_{2.5}$.[8] Where an applicant demonstrates that a reasonably accurate measure of the $PM_{2.5}$ fraction of a source's particulate matter emissions is available, Department staff may, in its reasonable discretion, assess potential impacts using the $PM_{2.5}$ fraction.

If primary PM_{10} emissions from the project do not equal or exceed 15 tons per year,[9] then the $PM_{2.5}$ impacts from the project shall be deemed insignificant and no further assessment shall be required under this policy.

D. Addressing Potential Impacts Arising from Secondary Formation

For projects with an annual potential to emit PM_{10} of 15 tons or more, calculated under Section V.C. above, Department staff shall require that the potential consequences of secondary formation of $PM_{2.5}$ be analyzed as part of the environmental assessment for proposed projects, as follows:

(1) provide a quantitative measure of potential $PM_{2.5}$ precursor emissions and qualitatively discuss potential secondary $PM_{2.5}$ formation (e.g. transformation products expected to be formed from precursor emissions); and

(2) demonstrate that the project will comply with all state and federal regulations and programs applicable to the emissions of $PM_{2.5}$ precursor pollutants.

E. Modeling Approach

For projects with an annual potential to emit PM_{10} of 15 tons or more, calculated under Section V.C. above, the Department shall require modeling analyses of $PM_{2.5}$ air quality impacts for both stationary and mobile sources attributable to the project consistent with the Department's existing practice for PM_{10} modeling. The Department shall require prior approval of an applicant's stationary and mobile source modeling protocol before the analysis is conducted. See Air Guide-26. Where impact mitigation is being proposed or required, such mitigation shall be included in the modeling conducted to demonstrate the net air quality impacts of the project together with the proposed mitigation.

The results of the air quality impact analyses must include a reasonably accurate measure of the project's expected contribution to annual and 24-hour ambient air concentrations in the area where the project is proposed to be built, both in micrograms per cubic meter and as a fraction of the annual and 24-hour NAAQS standards. The project's overall maximum impacts and receptor location should be provided. In addition, Department staff may require that community-wide impacts be provided using isopleths showing expected concentrations at various distances modeled from the source. These incremental impacts shall be used by staff in determining

---

[8]EPA has indicated that this is a conservative approach to analyzing impacts from a stationary source, and the Department will apply the same conservative approach to mobile source emissions in analyzing project impacts.

[9]15 tons per year is the existing de minimis threshold for PM_{10} in attainment areas, as well as the Significant Source Project threshold in non-attainment areas (6 NYCRR Subpart 231-2, Section 231-2.13). This threshold relates to PM_{10} emissions and not $PM_{2.5}$ emissions even in cases where the Department determines that $PM_{2.5}$ emissions are specifically quantifiable and could be lower.

whether the project's $PM_{2.5}$ emissions have a potential for significant adverse environmental impacts.

F. Thresholds for Determining Potential Significance

EPA established the $PM_{2.5}$ NAAQS to be protective of human health with an adequate margin of safety. In analyzing the potential impacts of a project's $PM_{2.5}$ emissions hereunder, Department staff shall use the federal $PM_{2.5}$ NAAQS as the relevant health benchmark. The values are:

Annual	15 $\mu g/m^3$
24 Hour	65 $\mu g/m^3$

A project with an annual potential to emit PM_{10} of 15 tons or more, calculated under Section V.C. above, will be deemed to have a potentially significant adverse impact if the project's maximum impacts are shown to constitute more than two percent (2%) of the annual NAAQS standard of 15 $\mu g/m^3$, i.e., 0.3 $\mu g/m^3$, or more than 5 $\mu g/m^3$ on a 24-hour basis.[10] Projects that exceed either the annual or 24-hour threshold will be required to prepare an Environmental Impact Statement (EIS) to assess the severity of the impacts, to evaluate alternatives, and to employ reasonable and necessary mitigation measures to minimize the $PM_{2.5}$ impacts of the source to the maximum extent practicable.

A project with an annual potential to emit PM_{10} of 15 tons or more, calculated under Section V.C. above, that is shown to have maximum $PM_{2.5}$ air quality impacts equal to or less than two percent (2%) of the annual NAAQS standard of 15 $\mu g/m^3$, or 0.3 $\mu g/m^3$, and equal to or less than 5 $\mu g/m^3$ on a 24-hour basis, will be considered to have insignificant impacts.

G. Assessing the Need for Mitigation

For any project Department staff determines will have a potentially significant adverse impact, as provided in Section V.F., the Department shall seek to ensure that impacts are minimized to the maximum extent practicable, in order to make its findings under SEQRA.

1. Stationary Sources. For stationary sources, mitigation may include any one or more of the following, or such other mitigation as is practicable under the circumstances:

   (a) implementation of an emission level compatible with the concept of the Lowest Achievable Emissions Rate (as outlined in 6 NYCRR 231-2) for $PM_{2.5}$; and/or
   (b) obtain reductions in emissions from other existing sources to offset the project's emissions; and/or
   (c) limits on the hours of operation or fuel used at the proposed project to minimize annual impacts.

[10]No PSD significance levels or increments have been established for $PM_{2.5}$. The two percent value is identical to the relationship between the established Significant Impact Level for PM_{10} under the federal Prevention of Significant Deterioration (PSD) air permitting program and the annual NAAQS for PM_{10}. The 5 $\mu g/m^3$ value is identical to the 24-hour significance level for PM_{10}.

2. Mobile Sources. For mobile sources, mitigation may include any one or more of the following mitigation measures, or such other mitigation as is practicable under the circumstances:

   (a) transportation demand reduction measures;
   (b) off-peak delivery schedules;
   (c) choice of fuel;
   (d) encourage car pooling; or
   (e) employer-subsidized public transportation.

Applicants should be encouraged to propose creative source specific mitigation measures for review by Department staff on a case by case basis.

RELATED REFERENCES: *Articles 3, 8 and 19 of the Environmental Conservation Law Title 6 of the New York Codes, Rules & Regulations Parts 200, 201, 617 & 621.*

Attachment C

DAR -10 / NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis	
New York State Department of Environmental Conservation **DEC Program Policy**	
Issuing Authority: David J. Shaw **Signature:**	**Title: Director, Division of Air Resources**
Date Issued: May 9, 2006	**Latest Date Revised:** May 9, 2006 **Unit:** Impact Assessment and Meteorology Section, Bureau of Stationary Sources

I. **Summary:** This guide provides the NYSDEC Division of Air Resources' recommended dispersion modeling procedures for conducting ambient impact analyses. These procedures essentially duplicate, in summary format, significant aspects of the Environmental Protection Agency's (EPA) approved methodologies, as incorporated in Appendix W of 40 CFR Part 51 regulations. Thus, familiarity with the latest version of EPA's *Guidelines on Air Quality Models* (EPA Guidelines) is assumed. The EPA Guideline document is available on the EPA SCRAM webpage.[1] Additional specific recommendations are provided herein to augment EPA methods or interpret New York specific regulations. For example, details are provided on: the application of the recently adopted AERMOD model during the one year transition period from ISC3; how to identify nearby sources for cumulative source analysis; and the interpretation of Subpart 231-2 (to be revised as Part 231) provisions on emission offset source location and net air quality benefit analysis.

II. Policy: Air quality dispersion modeling is sometimes required to support Prevention of Significant Deterioration (PSD), State or Title V permit applications and related actions. It is also used to support actions under the State Environmental Quality Review Act (SEQRA), such as the impacts from toxic emission sources, Environmental Justice assessments and the Department's policy on fine particulate matter (Commissioner's Policy CP-33). In performing such assessments, a set of recommended and acceptable procedures has been defined by EPA and NYSDEC to assist source applicants and their consultants to assure the proper application of the modeling analysis. The guidance is designed for use by specialists in dispersion modeling and assumes familiarity with EPA's modeling procedures. It provides a basis for the development of modeling protocols which are to be submitted for review and approval by NYSDEC prior to the submission of the modeling analysis. This step reduces the need for possible revisions to the modeling assessment and provides applicants with certain assurances on the acceptable procedures to be used in support documents for permit applications.

---

[1] http://www.epa.gov/ttn/scram/

III. Purpose and Background: This guide is intended for use by source applicants, project managers and their consultants who need to conduct ambient impact analyses in support of air permit applications and other activities which require air quality impact modeling. The guide is designed for use by specialists in dispersion modeling and assumes familiarity with EPA modeling procedures. It provides a basis for the development of modeling protocols which are to be submitted for review by NYSDEC. **This program policy replaces Air Guide-26 (revised 12/9/96).**

Some of the pertinent federal and New York State regulations which provide the basis for the Division of Air Resources' ambient impact analysis requirements are summarized in Appendix A. Analysis of air quality through modeling is used in establishing compliance with ambient air quality standards, Prevention of Significant Deterioration (PSD) increments, locating monitor sites, estimating health effects from toxic pollutants, and performing visibility and Air Quality Related Value (AQRV) assessments for PSD Class I areas.

As required by the original Prevention of Significant Deterioration (PSD) regulations, EPA has reviewed and amended its original 1978 procedures for modeling ambient impacts on a regular basis. This guide assumes user familiarity with the following EPA guideline document: EPA's *Guideline on Air Quality Models (Revised)*. Revisions were made as follows: EPA 450/2-78-027R, July 1986, and Supplement A (1987, 53 Fed. Reg. 393), Supplement B (1993, 58 Fed. Reg. 38816), Supplement C (FR, August 9, 1995) and the adoption of the CALPUFF model on April 15, 2003 and the latest adoption of the AERMOD model and some of the other modifications to the Guidelines on November 9, 2005. The Guideline was incorporated as Appendix W of 40 CFR Part 51, with proper Register formatting in a direct final rule on August 12, 1996 (FR V61, No.156). The specifics of the EPA recommended models and techniques are not repeated herein, but this guide summarizes some of the important aspects. Also, NYSDEC guidance is provided on the interpretation of EPA's Guidelines as well as on other specific topics.

IV. Responsibility: The responsibility for implementation, interpretation, and maintenance of this document rests with the Impact Assessment and Meteorology Section of the Bureau of Stationary Sources, Division of Air Resources (tel. 518-402-8403).

V. Procedure: This guide recommends specific modeling procedures to be used in the analysis of source air quality impacts. However, due to unique source-receptor considerations and the continuous evolution of dispersion modeling techniques and procedures, these guidelines are not all inclusive. Thus, the submission of a modeling protocol to the Department for review and concurrence is highly recommended. It is NYSDEC policy that any proposed application of the AERMOD model must receive prior approval during the one year transition period from ISC3, that is, till December 9, 2006. To expedite this latter approval, a detailed modeling protocol with specific input data descriptions must be submitted for approval prior to an application submittal. This step will minimize delays in the application review process. In cases where the proposed modeling procedures extend beyond the requirements discussed below, a meeting to resolve the issues might be appropriate. Where the proposed modeling procedures incorporate non-guideline aspects, the descriptions and background information should be submitted for review well in advance of the meeting.

The Department's modeling requirements for criteria versus non-criteria pollutants (e.g., toxic emissions) are at times different, due to differences in federal and State requirements in modeling toxic pollutants. The Department's approach to the control of toxic contaminants is contained in DAR-1 (formerly know as Division of Air Resources' Air Guide-1). The guide uses screening procedures and a software program as the initial step in analyzing source impacts. These methods were formulated in the early 1990s and are currently outdated in terms of recommended EPA procedures for certain source types (areas sources), source setting (complex terrain), as well as the adopted AERMOD procedures. However, for most situations, the procedures should still provide conservative (overestimated) long-term (annual) average and short-term (1-hour) impacts in relation to corresponding Annual and Short-term Guideline Concentrations (AGCs and SGCs) due to the conservative modeling assumptions incorporated in the procedures. The application of DAR-1 procedures should be limited to toxic pollutants and should not be used for criteria pollutant impact analysis, as stated in the cover memo of the 1995 release of the procedures. Furthermore, Appendix B of DAR-1 and the software program procedures should not be considered the final determination of source impacts. More refined impacts can be calculated, if necessary, using site specific data and modeling procedures provided herein.

Source analyses which must undergo both NYSDEC and EPA review (e.g. major sources) should adhere strictly to the requirements and preferred modeling procedures described in the EPA Guidelines, with the added requirements of NYSDEC on the application of AERMOD as described herein. In some instances, EPA's concurrence on a proposed modeling protocol may be sought by NYSDEC to address specific procedures which deviate from or enhance EPA's modeling procedures or policy.

In instances requiring only State review, NYSDEC may consider methods which deviate from or fill the void in specific EPA requirements. These deviations fall into two basic categories. The first includes procedures which NYSDEC staff have established as valid and technically supportable. An example of this is the method for defining nearby sources for cumulative analysis, as described below. The second category relates to deviations from established procedures which the applicant demonstrates as appropriate to the Department's satisfaction. An example of this is the application of CALPUFF for certain near-field analyses. Modeling protocols containing procedures which fall into the second category must contain full technical support documentation for review. Copies of references not easily accessible through general publications must be supplied. The acceptance of these specific modeling procedures should not be construed as blanket approval of their use, but will need to be approved on a case-by-case basis.

1. EPA Modeling Procedures

This section summarizes the basic modeling requirements from EPA's *Guideline on Air Quality Models* (Revised, November 9, 2006; FR Vol.70, No. 216) and presents the preferred EPA models and corresponding input parameters in a simple tabulated and reference format. Familiarity with EPA modeling guidelines is assumed. Further guidance on performing modeling analyses is provided in EPA's *New Source Review Workshop Manual* (Draft, October, 1990) which should be followed not only for all PSD permit applications, but also for addressing related aspects of other modeling analysis. EPA's modeling approach relies upon screening level modeling, followed by refined analysis when necessary. Until AERSCREEN (the screening version of AERMOD) is finalized, the main EPA screening procedures are contained in the SCREEN3 model user's guide and Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (EPA-450/R-92-019), October, 1992. The SCREEN3 model provides a comprehensive single source analysis. However, care should be exercised when calculating cavity impacts since the SCREEN3 cavity height formula may provide unrealistically high values (up to 2.5 times L for tall structures, i.e. $h_b/L > 1$). Thus, under these conditions, NYSDEC recommends the use of the old formula ($h_c = 1.5L_{min}$) as the upper limit to defining the cavity influence. SCREEN3 relies upon the ISC3 downwash algorithm. If it is desired to use the updated PRIME downwash algorithms for cavity and wake areas, then the AERMOD model must be used until AERSCREEN becomes available.

The models preferred by EPA for specific terrain settings, pollutants, source types, and dispersion conditions are summarized in Table 1. These models and their user's guides can be obtained from the EPA SCRAM webpage in footnote 1. The "source/condition" listed follows the grouping of the sections in the EPA Guidelines which address the specific topics. Both screening and refined modeling methods are listed. It should be noted that a number of techniques referenced require a case-by-case demonstration.

EPA's Modeling Guideline revisions of November 9, 2005 allow the substitution of AERMOD for ISC3 during the one year transition period until December 9, 2006, after which AERMOD will be the recommended refined model. The application of AERMOD and associated programs for simple and complex terrain may be used with proper input source, land use and meteorological data which must be documented in a modeling protocol. Guidances on the application of AERMOD under various conditions are provided in a document entitled *AERMOD Implementation Guide* on the SCRAM webpage. Further NYSDEC specific guidance is provided below.

The data requirements for the preferred models are discussed in the EPA Guideline and are duplicated in a checklist format in Appendix B. The checklist provides the standard set of input data and basic level of analysis required. Individual cases may need more detailed information. The various items noted in Appendix B are discussed further in appropriate sections of the EPA Guideline document. More specific data requirements are described in the user's guides for the individual models. However, a number of important items are briefly summarized below to allow for the development of an acceptable modeling protocol.

a) **Source Data** - Sections 8.1 and 8.2 and Tables 8-1and 8-2 of the EPA Guidelines describe the emission input requirements for the source under consideration. It also provides these requirements for the "nearby" and "other"sources for use in a cumulative analysis. Table 2 provides the same basic information on data inputs. In the screening phase, different load parameters should be considered to identify the worst case conditions. The worst case load and the maximum load conditions (if different) should be included in the refined analysis of short-term impacts. For annual impacts from existing sources, actual operating conditions or design/capacity factors can be used if determined to be representative. More specific guidance on the development of a source inventory for a cumulative analysis is contained in EPA's *New Source Review Workshop Manual* and in Appendix C.

b) **Good Engineering Practice (GEP) Stack Height Regulations** - On July 8, 1985, EPA promulgated final regulations regarding Good Engineering Practice (GEP) stack height (see 40 CFR 51.100(ii)). These regulations limit the degree to which a source can either increase the height of its stack or merge exhaust gas streams to enhance dispersion. The regulations provide a formula determination of GEP stack height which precludes the effects of aerodynamic downwash from nearby structures. The EPA technical support document (EPA-450/4-80-023R, revised 1985) should be followed to properly define the allowable stack height credit. Also, the latest version of EPA's Building Profile Input Program (BPIP with PRIME) should be used to generate wind direction specific building dimensions, as necessary for downwash calculations in the ISC3 or AERMOD models.

It is NYSDEC policy that proposals to construct or modify a source ensure that the associated stack be designed according to formula GEP height specifications (efforts to avoid downwash into the cavity region is especially encouraged). If such a stack height is not feasible, documented justification for the proposed stack height must be presented in the permit application. Such a justification may include aesthetic considerations, FAA and engineering or local zoning restrictions, and should not be based solely on acceptable ambient impact determinations. It is also NYSDEC policy that GEP stack height be minimized in order to reduce the impact on the area's aesthetics. This can be accomplished, for example, by lowering the height of any new nearby structures.

c) **Meteorological Data** - On-site (i.e. site-specific) meteorological data is generally preferred over National Weather Service data. This is especially true for complex terrain settings. EPA guidance requires at least one year of on-site data or five consecutive years of most recent, readily available, off-site data. EPA's guidance on the proper acquisition of site specific data is provided in the followed document: Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-005, Revised, February 2000. Addition guidance is provided in NYSDEC policy guide DAR-2: *Oversight of Private Air Monitoring Networks*[2] should be followed. The method of substituting for missing data, to achieve the 100% data input requirement of most models, should follow EPA's recommended procedures on the SCRAM web site.

Care should be exercised in determining stability class from on-site data. For example, if using either the sigma-E or sigma-A methods, the details of the method should be included in the modeling procedures for review and concurrence. An adjustment for surface roughness effects on the sigmas within 1 to 3km of the source is recommended in the above EPA document, but in

[2] http://www.dec.state.ny.us/website/dar/ood/policydocs.html

NYSDEC staff's judgement, the adjustment should be limited to the roughness length within 1 km of the meteorological instrument site.

d) **Receptor Data** - Source analyses should consider both simple terrain (below stack height) and complex terrain receptor impacts. The radial receptor grids for refined analyses must be comprehensive enough to identify the maximum impacts to at least a 100m receptor spacing. For Cartesian grids, this latter spacing translates to a maximum 70m grid spacing such that the diagonal (or radial) of the grid is resolved to 100m. For the source under review, impacts must be predicted at all locations inside and outside of the plant property which are not fenced in or at which public access is not prohibited (i.e. all ambient air receptors). Additional receptors at or beyond the plant property might have to be placed to properly resolve maximum impacts. This may be done using discrete receptors or grid cells such that the radial distance between the receptors along the property line are equivalent to 10 degree increments. In addition, a denser vertical grid is necessary for certain complex terrain applications, such as the use of CTSCREEN or CTDMPLUS. EPA guidance on receptor placement for these models should be followed. Occasionally, elevated receptors in the proximity of the source (i.e., about 2 km) need to be assessed. Such receptors include rooftops, balconies and similar areas with public access, but not at open windows or air intakes, in accord with EPA policy.[3] In some instances, ground level and elevated receptors must be placed on and off the source property to which the public has access (e.g., hospitals, universities, etc.).

2. Supplemental NYSDEC Modeling Procedures

a) **Application of AERMOD** - A number of input parameters and steps in the AERMOD modeling system application require professional judgement. Interim to the development of a set of standard input parameters and more detailed guidance on certain AERMOD applications, it will be necessary for applicants to detail these input data and procedures in a modeling protocol to be submitted for NYSDEC staff review and approval prior to the submission of the modeling analysis. For the 1 year transition period until December 9, 2006, an AERMOD modeling protocol is required.

The modeling protocol must address guidance specified in EPA's *AERMOD Implementation Guide* and should detail the proposed land use and meteorological data and the sources and references for the data. NYSDEC recommends that receptor terrain data (Digital Elevation Model, DEM) be resolved to a minimum of 30m and, preferably, to 10m. For most of New York State, the 30m resolution data is not available, but 10m digital data is available for all of New York State.

---

[3] http://www.epa.gov/region07/programs/artd/air/nsr/nsrpg.htm. Letter from John Seitz, dated April,13, 1992.

EPA revised the AERMAP (version 04300) program on the SCRAM webpage on December 22, 2005 which supports the use of 10m data (as well as 30m) and that version should be used with AERMOD applications. There are a number of internet sites where land use, terrain, census and meteorological data are available. Some of the governmental sites where data is available free of charge and is relatively easy to use listed below. However, this list does not preclude the use of other available data nor is it meant to be an "approved" list by NYSDEC. All data should be identified and discussed in the modeling protocol.

The governmental sites for land use, terrain and census data are:

USGS - http://edc.usgs.gov/geodata This site provides access to both Land Use/Land Cover data and 1 Deg. DEMs (90m resolution data). The latter is likely to be the only data input allowed in the AERSCREEN model when it is formally adopted by EPA. For the 7.5 minute DEMs, this site directs to other sites which provide free downloads of the terrain data in SDTS (Spatial Data Transfer Standard) format and which can be converted to DEM data by an EPA processor for use in AERMAP. These sites are: http://gisdatadepot.com/dem and http://www.mapmart.com

Cornell - http://cugir.mannlib.cornell.edu/index.jsp CUGIR (Cornell University Geospatial Information Repository) provides geospatial data for New York State. The 7.5 minute DEMs, (10m resolution), Land Use/Land Cover data, census data, and other data are available for free download.

The New York State GIS Clearinghouse - http://www.nysgis.state.ny.us provides downloads of ortho-photos of New York State.

For AERMOD applications in complex terrain settings, a demonstration of meteorological data representativeness must be made; this same level of demonstration of representativeness has been required in the past for other models. That is, if nearby or other available meteorological data sets are deemed not representative of the complex terrain features of a project site, then AERMOD/ISC3 application must be limited to the simple terrain receptors. In these cases, complex terrain impacts can be determined by the appropriate screening or refined models from EPA's Modeling Guidelines (i.e. CTSCREEN and CTDMPLUS).

For AERMOD application involving area sources, NYSDEC recommends the application of the area source algorithm in all instances. This differs from EPA's guidance in the *AERMOD Implementation Guide*. That is, instead of the simulating area sources as volume sources at receptors distant from the source boundary, the area source modeling results should be reviewed if concerns arise with maximum impacts under unrealistically low wind speed conditions. These impacts should be demonstrated, reviewed and resolved on a case-by-case basis.

b) **Toxic Contaminants** - Screening procedures for the calculation of the annual average and short-term (1-hour) impacts of toxic air contaminants have been specifically formulated and are contained in New York State DAR-1 (Appendix B, October 15, 1995 Edition). A software program (DAR-1, Version 3.6), associated user's guide and supporting documentation are also available through the NYSDEC Webpage.[4] These procedures serve as a tool which allows the NYSDEC regional staff and source applicants to perform a first level screening analysis of predicted impacts for comparison to health-effect based annual and short term guideline concentrations (AGCs and SGCs). The use of a refined site specific analysis for a project is a preferred and acceptable substitute for DAR-1 procedures. A modeling protocol should be submitted for review in this instance.

c) **Background Concentrations for Standards Compliance** - The two components of background concentrations are the calculated nearby source impacts and a regional background level. Regional background concentrations are determined using available monitoring data. These data are available mainly from routine NYSDEC monitor locations and summaries can be obtained from the NYSDEC public webpage. More detailed data can be obtained from the Bureau of Air Quality Surveillance (518-402-8508). For conservative estimates of total concentrations, NYSDEC recommends the use of the highest-second-highest (HSH) short term and maximum annual concentrations from the last three years of most recent data. In some instances (e.g.PM_{10}) monitors have been discontinued or replaced (such as $PM_{2.5}$ for PM10) and the use of the most recent years of available data can be substituted with a showing or representativeness. If it is necessary to refine these conservative background levels to correspond to the meteorological data associated with the worst case impacts, EPA guideline procedures may be used. On-site (i.e. site specific) collected monitoring data should conform to the EPA document: *Ambient Monitoring Guidelines for Prevention of Significant Deterioration(PSD), EPA-450/4-87-007, May 1987* and DEC policy DAR-2: *Oversight of Private Air Monitoring Networks*.

For applications requiring nearby source modeling, NYSDEC Regional or Central Office staff will assist in the development of an emissions inventory to be used in a cumulative impact analysis. Detailed guidance is provided in Appendix C and NYSDEC's policy document: *Emission Inventory Development for Cumulative Air Quality Impact Analysis*. It should be noted that it is the applicant's responsibility to assure the adequacy of the source inventory data. The first step in the process is for the applicant to determine the pollutants which have maximum impacts above significant impact levels (SIL) and the

[4]http://www.dec.state.ny.us/website/dar/index.html

corresponding significant impact areas. Cumulative impact analysis is required for those pollutants for which the source under consideration has impacts above the SILs. The cumulative analysis must be performed over the entire receptor grid defined in the circular Significant Impact Area (SIA) of the source under review. SIA is defined as the circular area which extends from the source to the farthest receptor distance at which the source has a significant impact.

d) **Complex Terrain** - Based on EPA policy, the use of the EPA screening complex terrain models which require hourly meteorological data (Complex I and RTDM) should be limited to sources which have on-site meteorological data. On a case-by-case basis, NYSDEC will consider application of the Complex I model with off site, but representative data in non-PSD source applications. A detailed showing must be made by the applicant of this representativeness to NYSDEC's satisfaction. The use of Complex I for multi-source analysis using hourly data is especially useful in identifying source contributions to modeled standard exceedances. Furthermore, if there is no representative meteorological data and relatively low and/or distant isolated terrain features are of interest, a demonstration can be made that simple terrain impacts dominate those in complex terrain in all conditions (such as from SCREEN3/Valley calculations). In this case, the refined analysis can be used to calculated maximum controlling impacts in non-complex terrain areas.

e) **PSD Increment Analysis** - The implementation of the Prevention of Significant Deterioration (PSD) regulations are no longer delegated to NYSDEC by EPA as of March 3, 2003.[5] NYSDEC is in the process of proposing it's own PSD regulations. Until these regulations are promulgated, all PSD permit source applications must follow the EPA Modeling Guideline procedures in addition to the requirements of this guide if NYSDEC review is also involved for associated permits. NYSDEC retains the database for the PSD permits issued to sources prior to March 3, 2003 which can assist in the cumulative analysis of increment consumption. Appendix D depicts and tabulates the Air Quality Control Regions (AQCR) where the PSD minor source baseline dates have been triggered and lists the corresponding PSD permitted sources. All PSD source analyses must consider the incremental SO_2, NO_2, and PM_{10} impacts of existing and other proposed PSD sources (i.e., an application submitted to EPA Region II thirty days prior to the source under review). Furthermore, these sources are to be included in the standards compliance analysis. In addition, PSD increments and, where applicable, Federal Land Managers' (FLM) defined Air Quality Related Values (AQRVs) must be analyzed for all Class I areas within 100km of the source. On a case-by-case basis, a larger distance cut off can be required by the FLM or EPA Region II staff.

f) **Nonattainment Area and Ozone Transport Region (OTR) Modeling:** There are

---

[5] Letter dated 5/24/04 from DEC Commissioner to EPA Region II

two basic modeling requirements for sources in the current nonattainment areas for ozone, PM_{10} and $PM_{2.5}$: 1) demonstration of insignificant impacts, and 2) a net air quality benefit analysis. However, no explicit single source ozone modeling is required by NYSDEC, other than the demonstration that the necessary offsetting emissions are obtained from an appropriate "contributing" area following the procedures in Appendix E. On the other hand, PM_{10} and $PM_{2.5}$ nonattainment areas require explicit modeling of insignificant impacts and a net air quality benefit analysis for the direct emissions of PM_{10} and $PM_{2.5}$. When established by EPA and promulgated in regulations, $PM_{2.5}$ precursors will have offset requirement similar to those for ozone precursors. Sources which fall under the review of Part 231 must follow the guidance in Appendix E: *Interpretation of Part 231 Provisions on Emission Offset Source Location and Net Air Quality Benefit Analysis.*

g) **Modeling Protocol Submission** - The processing of proposed projects should be initially directed to the appropriate NYSDEC Regional office. Specific guidance and recommendation on modeling procedures may be obtained from the staff of the Impact Assessment and Meteorology (IAM) Section in Central Office (Albany) in formulating an acceptable modeling protocol. A copy of the protocol should be submitted to both the NYSDEC project manager and the IAM Section. For AERMOD applications during the one year transition period ending on December 9, 2006, a modeling protocol is required prior to permit application submittal. Beyond that date, a modeling protocol is still highly recommended to avoid use of inappropriate AERMOD model input parameters and applications.

VI. Related References:

EPA's *Guideline on Air Quality Models (Revised, November 9, 2005):* as Appendix W of 40 CFR Part 51.

Emission Inventory Development for Cumulative Air Quality Impact Analysis, Revised, 2006.

EPA's *New Source Review Workshop Manual* (Draft, October, 1990).

TABLE 1

EPA Recommended Modeling Procedures for Terrain Setting, Pollutants, Source Types, and Dispersion Conditions

Source / Condition	Screening Method[7,8]	Refined Method
Simple terrain Single/Multiple or Complicated Source[6]	SCREEN3 AERSCREEN when finalized	ISC3[7] or AERMOD untill 12/9/06 AERMOD after 12/9/06
Complex Terrain (Plume Impaction)	CTSCREEN, Valley, COMPLEX I	AERMOD and CTDMPLUS
Ozone (urban applications)	OZIPR (case-by-case approval)	CMAQ, UMV or alternative model[8]
$PM_{2.5}$ and PM_{10}	Direct emission-Gaussian models SCREEN3 or AERSCREEN when finalized Secondary emissions: case-by-case approval	Direct emissions-ISC3 or AERMOD per above schedule Secondary formation or multi-source cases: REMSAD/CMAQ
Carbon Monoxide	CAL3QHC/MOBILE6	CAL3QHCR/MOBILE6 case-by-case for urban-wide basis
Nitrogen Dioxide	Two level screen: 1) Gaussian model (e.g., ISC or AERMOD) with total conversion of NOx to NO_2 2) Ambient Ratio Method of: default NO to NO_2 ratio 0f 0.75, or site specific developed ratio In multi-source urban areas, a proportional model can be used	Case-by-case analysis
Fugitive Emissions or Deposition	SCREEN3 or AERSCREEN when finalized	ISC3 or AERMOD (case-by-case), with refinement using gravitational settling and dry deposition
Lead	Source specific models (long-term)	ISC3/AERMOD/CALINE3 or urban-wide models

---

[6] Complicated sources are sources with special problems such as aerodynamic downwash, particle deposition, volume and areas sources, etc.

[7] BLP model can be used for buoyant line sources.

[8] Alternative Air Quality Models on SCRAM webpage(formerly Appendix B of EPA Modeling Guidelines).

Source / Condition	Screening Method[7,8]	Refined Method
Long Range Transport (beyond 50km) Models	Case-by-case models per IWAQM[9] and FLAG[10] recommendations	CALPUFF and FLAG/IWAQM recommendations
Fumigation	Radiational and Shoreline (SCREEN3 model)	SDM (sea breeze)
Valley Stagnation or Complex Winds	-----	CALPUFF
Visibility and Haze	VISCREEN	PLUVUE II, CALPUFF, CMAQ
Toxics (Dense Gas Dispersion)	TSCREEN	DEGADIS or other alternative models
Risk Assessment	----	Deposition from ISC3/AERMOD
Offshore Source	----	OCD Model

9 Interagency Workgroup on Air Quality Modeling (IWAQM) Phase I and II Recommendations.

10 FLM's Air Quality Related Values Workgroup (FLAG)

TABLE 2

MODEL EMISSION INPUT DATA FOR POINT SOURCES*

Averaging Time	Emission Limit (#/MMBtu)** X	Operating Level (MMBtu/Hr)** X	Operating Factor (e.g., Hr/yr, Hr/day)
Stationary Point Source(s) Subject to SIP Emission Limit(s) Evaluation for Compliance with Ambient Standards (Including Areawide Demonstrations)			
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.	Actual or design capacity (whichever is greater), or federally enforceable permit condition.	Continuous operations for proposed new or modified sources, unless permit limited. Actual operating factor averaged over most recent 2 years for existing sources.***
Short term	Maximum allowable emission limit or federally enforceable permit limit.	Actual or design capacity (whichever is greater), or federally enforceable permit condition.****	Continuous operation, i.e., all hours of each time period under consideration (for all hours of the meteorological data base).****
Nearby Background Source(s)	Same input requirements as for stationary point source(s) above.		
Other Background Source(s)	If modeled (See Section 8.2.3 of EPA's Guidelines), input data requirements are defined below.		
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.	Annual level when actually operating, averaged over the most recent 2 years.***	Actual operating factor averaged over most recent 2 years.***
Short term	Maximum allowable emission limit or federally enforceable permit limit.	Annual level when actually operating, averaged over the most recent 2 years.***	Continuous operation, i.e., all hours of each time period under consideration (for all hours of the meteorological data base).*****

TABLE 2 Footnotes

* The model input data requirements shown on this table apply to stationary source control strategies for SIPs, emissions trading, new source review, or prevention of significant deterioration. Refer to the policy and guidance for these programs to establish the required input data.

** Terminology applicable to fuel burning sources; analogous terminology, e.g., #/throughput may be used for other type of sources.

*** Unless it is determined that this period is not representative.

**** Operating levels such as 50 percent and 75 percent of capacity should also be modeled to determine the load causing the highest concentration.

***** If operation does not occur for all hours of the time period of consideration (e.g., 3 or 24 hours) and the source operation is constrained by a federally enforceable permit condition, an appropriate adjustment to the modeled emission rate may be made (e.g., if operation is only 8:00 a.m. to 4:00 p.m. each day, only these hours will be modeled with emissions from the source. Modeled emissions should not be averaged across nonoperating time periods.)

APPENDIX A: Legislative Mandates

1) The Clean Air Act (CAA)

The Federal Clean Air Act as amended in 1977 and 1990 provides the primary framework of the State's air pollution control program. This act called for the Environmental Protection Agency (EPA) to establish national ambient air quality standards, establish air quality control regions, and provide grants for the support of air pollution planning and control programs. The plans and programs developed through this support are commonly known as the State Implementation Plan (SIP). New York State has a plan which relies on the analysis of air quality impacts through evaluation of source characteristics and the atmospheric dispersion processes. This approach is common to all state SIPs. The analytical approaches to be followed are defined under the EPA's Modeling Guidelines (Appendix W of 40 CFR Part 51) and other support documents.

2) Article X (Rescinded)

This portion of New York State Law governs the siting of power generators greater than 50 megawatt capacity facilities in New York State. A portion of the requirements for obtaining the necessary approval (Certificate of Need and Environmental Compatibility) is a dispersion analysis of air quality impacts.

3) The State Acid Deposition Control Act (SADCA)

This act was passed by the New York State Legislature and approved by the Governor on August 6, 1984. The act requires the Department to develop a comprehensive program dealing with acid deposition impacts by programs enacted to reduce emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x). Both programs are based on long range transport modeling results.

4) Rules and Regulations of New York State

The rules and regulations of the Department are a reflection of the SIP noted in 1 above and as such denote some of the particular requirements of the Division's program for impact analysis. For example:

a) **Part 201** - requires sufficient information to be submitted with an application to allow the demonstration of Ambient Air Quality Standards (AAQS) attainment and the evaluation of alternative emission and control measures.

b) **Part 212** - requires an analysis of process source impacts as necessary to assign environmental ratings and control levels.

c) **Part 219** - requires an analysis of the impact from municipal and infectious waste incineration.

d) **<u>Part 225</u>** - requires an analysis demonstrating compliance with AAQS and impact offsets at sensitive acid deposition receptors.

e) **<u>Part 231</u>** - requires sources that are subject to PSD review, emission offsets and other requirements in nonattainment areas to submit an impact analysis showing standards compliance, PSD increment consumption, Air Quality Related Value analysis, and insignificant impacts and a net air quality benefit for PM_{10} and $PM_{2.5}$.

f) **<u>Part 257</u>** - sets forth the AAQSs for the criteria pollutants against which impacts are compared.

g) **<u>Part 621</u>** - preparation of an Environmental Impact Statements (EIS) pursuant to Part 617 for projects deemed to have a significant environmental impact. An air quality analysis may be part of this EIS.

APPENDIX B

EXAMPLE AIR QUALITY ANALYSIS CHECKLIST[11]

1. Source location map(s) showing location with respect to:

- Urban areas
- PSD Class I areas
- Nonattainment areas[12]
- Topographic features (terrain, lakes, river valleys, etc.)
- Other major existing sources and other major sources subject to PSD requirements
- NWS meteorological observations (surface and upper air)
- Onsite/local meteorological observations (surface and upper air)
- State/local/onsite air quality monitoring locations
- Plant layout on a topographic map covering a 1 km radius of the source with information sufficient to determine GEP stack heights

2. Information on urban/rural characteristics:

- Land use within 3 km of the source classified according to Auer, A.H. (1978): Correlation of land use and cover with meteorological anomalies, J. of Applied Meteorology, 17:636-643.
- Population
    - total
    - density
- Based on current guidance determination of whether the area should be addressed using urban or rural modeling methodology.

3. Emission inventory and operating/design parameters for major sources within the region of significant impact of proposed site (see Appendix D):

- Actual and allowable annual emission rates (g/s) and operating rates
- Maximum design load or allowable short-term emission rates (g/s)[13]
- Associated emissions/stack characteristics as a function of load for maximum,

---

[11] From EPA's SCRAM web site, Subsection 2.3, referenced in the Modeling Guidelines.

[12] Within 50 Km or distance to which source has a significant impact, whichever is less.

[13] Maximum allowable emissions represent the worst case permitted emissions which can occur at the source under design or full load conditions on a short term basis, or under federally enforceable permit limit conditions.

average, and nominal operating conditions. Screening analyses or detailed analyses, if necessary, must be employed to determine the constraining load condition (e.g., 50%, 75%, or 100% load) to be relied upon in the short-term modeling analysis.

- location (UTM's)
- height of stack (m) and grade level above MSL
- stack exit diameter (m)
- exit velocity (m/s)
- exit temperature (°K)

° Area source emissions (rates, size of area, height of area source)

° Location and dimensions of building (plant layout drawing)

- to determine GEP stack height
- to determine potential building downwash considerations for stack heights less than GEP

° Associated parameters

- boiler size (megawatts, maximum rated heat input (mmBtu/hr.), pounds/hr. steam, fuel consumption, etc.)
- boiler parameters (% excess air, boiler type, type of firing, etc.)
- operating conditions (pollutant content in fuel, hours of operation, capacity factor, % load for winter, summer, etc.)
- pollutant control equipment parameters (design efficiency, operation record, e.g., can it be bypassed?, etc.)

° Anticipated growth changes

4. <u>Air quality monitoring data</u>:

° Summary of existing observations for latest three years (including any additional quality-assured measured data which can be obtained from any state or local agency or company)

° Comparison with standards

° Discussion of background due to un-inventoried sources and contributions from outside the inventoried area and description of the method used for determination of background (should be consistent with the Guideline on Air Quality Models)

5. <u>Meteorological data</u>:

° One or more years of hourly sequential on-site data, or five consecutive years of the most recent representative sequential hourly National Weather Service (NWS) data.

° Discussion of meteorological conditions observed (as applied or modified for the site-specific area, i.e., identify possible variations due to differences between the monitoring site and the specific site of the source)

- Discussion of topographic/land use influences

6. Air quality modeling analyses:

- Model each individual year for which data are available with a recommended model or model demonstrated to be acceptable on a case-by-case basis

  - urban dispersion coefficients for urban areas
  - rural dispersion coefficients for rural areas

- Evaluate downwash if stack height is less than GEP

- Define worst case meteorology

- Determine background and document method

7. Reporting of modeling result:

The air quality modeling analysis should provide, at a minimum, details on the following information:

- Model input and output files, including the meteorological data, receptor height and other supporting modeling files (e.g., BPIP input and output files for building downwash).

- The listing of maximum impacts and associated receptor locations, meteorological data, and modeling scenario for each applicable averaging time and pollutant.

- Comparison to NAAQS, PSD increments, AGCs/ SGCs, AQRVs for the source under review and any cumulative sources which were modeled.

APPENDIX C

Nearby Source Determination Scheme for Cumulative Impact Analyses

In order to conduct a proper cumulative analysis for the purpose of demonstrating standards compliance and PSD increment consumption, a detailed source inventory must be developed by the applicant. A cumulative analysis will be required for pollutants and averaging times for which the source under review has significant impacts. Prior to developing a source inventory, the applicant should calculate the Significant Impact Areas (SIA) of the source under review for all pollutants (SO_2, TSP, NO_2, CO) for which the source's maximum impacts are above significant impact levels. The SIA should be determined in accordance with Chapter C of the EPA New Source Review Workshop Manual (Draft, October 1990).

For pollutants with significant impact areas, it will be necessary to develop a list of all major nearby point sources to be included in the cumulative analysis for standards compliance. For the purpose of this analysis, "major" is conservatively taken to mean all emission points with maximum allowable emissions equal to or greater than 100 ton/year (23 lb/hr). However, in order to have a manageable set of sources, this size cut-off can be increased on a case-by-case review basis. A list of all point sources meeting this criterion and which are within the annular area defined as the largest SIA plus 50km of the proposed source should be obtained from the NYSDEC permit reviewer (usually a regional staff member). A smaller inventory area than this annular area can be determined on a case by case basis for minor source projects.

As noted in Chapter C of the EPA New Source Review Workshop Manual (Draft, dated October, 1990): "When a full impact analysis is required for any pollutant, the applicant is responsible for establishing the necessary inventories of existing sources and their emissions, which will be used to carry out the required NAAQS and PSD increment analyses." The document also notes that "the permitting agency may provide the applicant a list of existing sources upon request, once the extent of the impact area(s) is known. The permitting agency should review all required inventories for completeness and accuracy."

In order to fulfill the requirements of this guidance, the applicant will be provided a listing of sources which meet the criteria noted above from NYSDEC's Air Facilities System (AFS). A request for this data should be made to the NYSDEC Division of Air staff who will review the project application. The data included in these files are incomplete and, in most cases, do not contain all of the emission parameters needed for modeling purposes. This data should serve only as a starting point for developing the needed inventory data. The applicant must ensure that all of the stack, emission, and building parameters used in the cumulative analysis are correct.

The detailed steps in obtaining the initial source list, and preparing and submitting the emission inventory is provided in NYSDEC guidance: *Emission Inventory Development for Cumulative Air Quality Impact Analysis*. The guidance notes that it is ultimately the applicant's responsibility to assure that a valid inventory is used in the modeling analysis, but it is ultimately the permitting agency's (NYSDEC) decision as to the final set of sources to be modeled for NAAQS compliance. The EPA NSR Workshop Manual (1990) and the Modeling Guidelines recognize the flexibility allocated to the permitting agency in this matter.

NYSDEC guidance references a procedure which can be used with the initial set of sources provided to the applicant to define the subset of nearby sources to be explicitly modeled. The procedure is known as the GRAD/D^2 method which was formulated and found to be a good indicator of EPA's terms "significant concentration gradient" and "nearby" (May, 1992 NYSDEC document). It was reviewed by EPA and approved on a case-by-case application basis (OAQPS Clearinghouse Memo dated March 31, 1994).

The GRAD/D^2 method is applied to the initial set of all major sources in the SIA plus 50km area as follows:

1) Determine the concentration gradient (GRAD) between the maximum impact location(X_{max}) and 1000m downwind from this location($X_{max+1000}$) using the SCREEN3 (or equivalent) model as:

$$GRAD=(X_{max} - X_{max+1000})/1000m$$

2) Determine the distance D (in Km) from the background source to the proposed source and calculate GRAD/D^2 for each source.

3) Rank order, from highest to lowest, the sources according to the GRAD/D^2.

4) All sources equal to and above 1% of the maximum GRAD/D^2 ratio should be modeled as nearby sources.

It must be emphasized that the final set of sources to be modeled, including additional sources from the initial list, is to be based on professional judgement, as applied on a case-by-case basis. For example, in cases where the top ranked source is an "outlier" from the rest of the top few ratios, the 1% cutoff will not identify an adequate number of sources. In this instance, the proposal should use the second or subsequent sources in the GRAD/D^2 ranking to define the 1% cut-off sources.

Furthermore, for PSD applicable sources where PSD increment analysis is to be performed, all PSD permitted sources within 50 km of the SIA should be included in the modeling analysis for both increment and NAAQS analysis, unless it has been previously established that a particular source has insignificant impacts for the pollutant under consideration. This is practical, since the PSD sources list contained in Appendix D of this guide is a limited set for which emission parameter data are relatively easy to obtain.

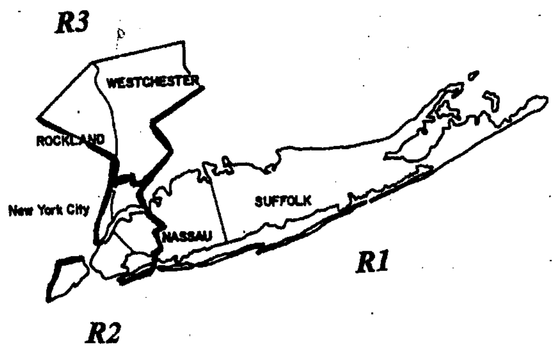
The methodology for developing a nearby source list should be identified in the modeling protocol. Once the applicant develops the nearby source list, it should be provided to Impact Assessment and Meteorology (IAM) staff for review and approval. To avoid re-modeling and other delays, the modeling analysis results that support the permit application should be submitted only after the source emission data are found appropriate by the permit reviewer and the final nearby list is approved by IAM staff.

APPENDIX D

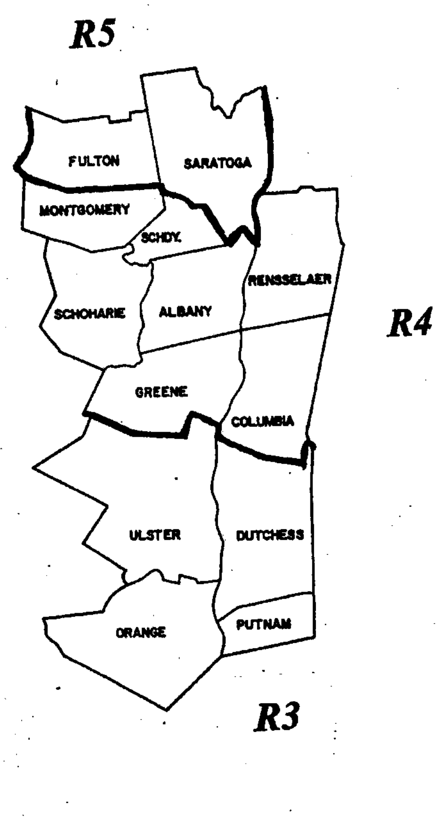
PSD Baseline Areas per Air Quality Control Regions (AQCRs) and List of PSD Permits with Corresponding Minor Source Baseline Dates

The baseline areas in New York State were defined in accord with the pre-established eight AQCRs at the time of the initial PSD regulations. These areas are depicted in the following figures. The minor source baseline dates for these areas are established by the first PSD source in the AQCR and have been triggered for all of the AQCRs and for SO_2, NO_2 and PM_{10}. The PSD source which triggered these dates and all subsequent PSD sources through April, 2006 are provided in the table which follows the figures. The emissions data for these sources can be provided by contacting DEC staff in the region in which the source is located or staff from the Bureau of Stationary Sources (BoSS). For PSD sources subsequent to the end of the PSD delegation agreement of March 3, 2003, applicants can still obtain the emissions and stack information from NYSDEC staff, with concurrence from EPA Region II staff on the PSD imposed emission limits. As DEC works to promulgate its own PSD regulations, the source data will continue to be available from our Regional offices or BoSS staff.

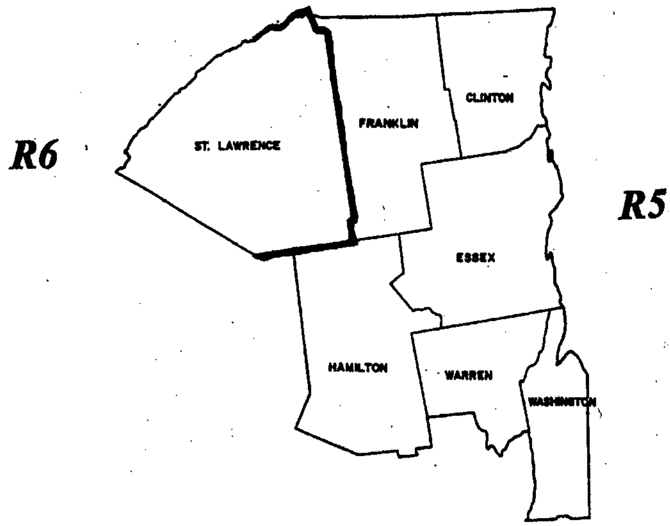
Metropolitan Air Quality Control Region



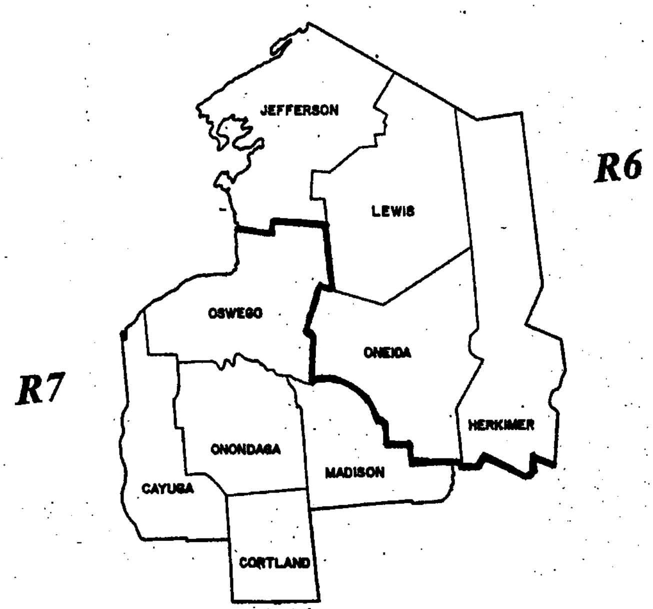
Hudson Valley Air Quality Control Region



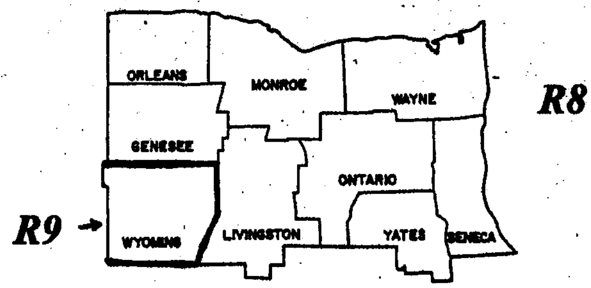
Northern Air Quality Control Region



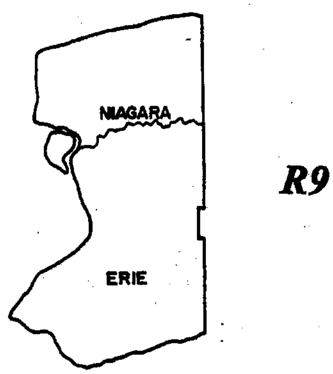
Central Air Quality Control Region



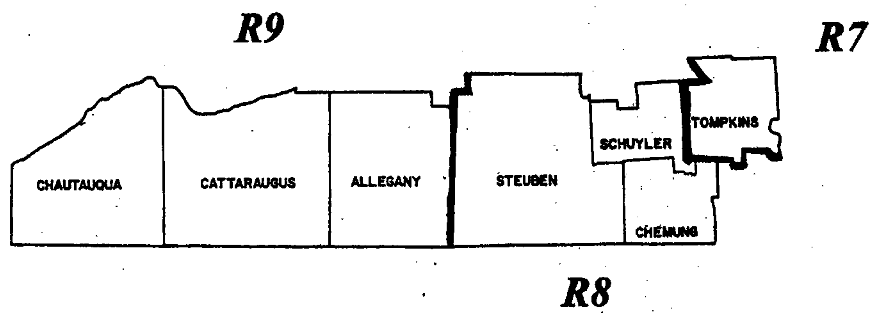
Genesee-Finger Lakes Air Quality Control Region



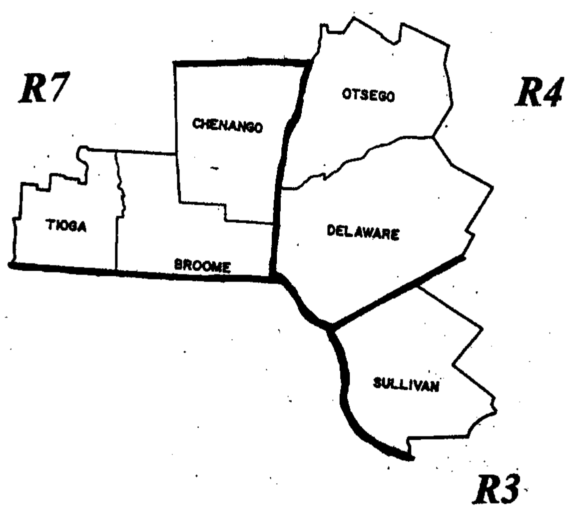
Niagara Frontier Air Quality Control Region



Southern Tier West Air Quality Control Region



Southern Tier East Air Quality Control Region



NEW YORK STATE PSD PROJECTS ACCORDING TO AQCRs
As of April 24, 2006

		PERMIT DATE	PM	SO_2	NO_2
METROPOLITAN AQCR					
1	GLEN COVE RRF [2]	11/03/78	X	X	
2	PROCTOR & GAMBLE [2]	02/25/82			
3	WESTCHESTER COUNTY RRF	02/22/82			
4	ISLIP RRF	10/03/84			
5	BABYLON RRF	09/12/85			
6	HEMPSTEAD RRF	04/16/86			
7	ALGONQUIN GAS	04/16/86			
8	HUNTINGTON RRF	04/13/88			X
9	TRIGEN COGEN	04/23/88			
10	TBG COGEN	06/01/88			
11	LILCO-BROOKHAVEN	11/16/88			
12	WYETH-AYERS T (LEDERLE LABS)	04/11/89			
13	PILGRIM ENERGY	11/11/92			
14	HOLTSVILLE/PASNY	09/01/92			
15	FRESH KILLS FLARING	9/97			
16	SCS ASTORIA ENERGY	10/31/01			
17	CON EDISON EAST RIVER	7/18/01			
18	NYPA POLETTI EXPANSION	4/29/02			
19	KEYSPAN RAVENSWOOD	8/31/01			
20	CAITHNESS ENERGY, BELLMORE	Draft, 12/19/05			
HUDSON VALLEY AQCR					
1	CIBRO PETROLEUM [2]	09/27/78		X	
2	SHERIDAN STEAM STATION [2]	11/03/78			
3	NEW ENGLAND LAMINATES	12/18/78			
4	CALLANAN INDUSTRIES [4]	03/15/79	X		
5	NEPERA CHEMICAL CO. [4]	04/14/80			
6	DUTCHESS RRF	04/20/83			
7	GE R&D CENTER	08/23/84			
8	METAL CONTAINER CORP.	02/03/88			
9	KAMINE S. GLENS FALLS	05/13/88			X

		PERMIT DATE	PM	SO_2	NO_2
10	JMC SELKIRK I - MOD	07/15/94			
11	JMC SELKIRK II	06/03/92			
12	HALFMOON - INTERPOWER [1]	10/26/92			
13	PG&E ROTTERDAM [1]	10/19/92			
14	ATHENS GENERATING COMPANY	06/12/00			
15	BETHLEHEM ENERGY CENTER	2/13/02			
16	EMPIRE-BESICORP ENERGY	8/04			
NORTHERN AQCR					
1	ADIRONDACK RRF	12/11/85	X	X	
2	ST.LAWRENCE CITY RRF [2]	06/15/88			
3	MEGAN-RACINE (KRAFT) [2]	11/02/88			X
4	BORALEX CHATEAUGAY - MOD	12/30/94			
5	SARANAC COGENERATION - MOD	11/23/94			
6	GM POWERTRAIN MOD [4]	12/93			
7	CORNING GLASS EXPN.-CANTON	6/24/96			
SOUTHERN TIER EAST AQCR					
1	IBM ENDICOTT	04/20/86	X	X	
2	ANITEC/BINGHAMTON COGENERATION [2]	09/12/90			X
SOUTHERN TIER WEST AQCR					
1	CONSOLIDATED GAS (BORGER STATION)	10/13/83			
2	KAMINE/BESICORP CORNING [1]	11/11/92	X	X	X
CENTRAL AQCR					
1	OSWEGO CTY. ASPHALT [3]	05/22/79			
2	ARMSTRONG CORK CO.	11/26/79	X		
3	ANHEUSER-BUSCH	01/31/80			
4	GRIFFISS AFB [4]	12/20/82			
5	AUBURN STEEL CO.	09/27/83			
6	FORT DRUM COGEN	04/01/87		X	
7	KAMINE - CARTHAGE	08/17/88			X
8	MORRILL PRESS	10/05/88			
9	L & J ENERGY SYSTEMS (KRAFT-LOWVILLE) [1]	11/02/88			
10	INDECK ENERGY SYSTEMS HAMMERMILL	03/08/89			

		PERMIT DATE	PM	SO_2	NO_2
11	GAS SYRACUSE	09/20/89			
12	KAMINE SYRACUSE - MOD	12/20/94			
13	ONONDAGA RRF	07/15/92			
14	CNG TRANSMISSION	11/01/92			
15	KAMINE/BESICORP BEAVER FALLS	11/06/92			
16	SITHE - INDEPENDENCE - MOD	06/29/94			
17	FULTON COGEN - MOD	10/13/93			
18	NUCOR STEEL, AUBURN	8/03			
GENESEE-FINGER LAKES AQCR					
1	IRIQUOIS ROCK	03/26/79			
2	NYSEG SOMMERSET	05/23/79		X	
3	ROCHESTER ASPHALT	06/07 79			
4	KODAK - KP44	09/22/82	X		
5	KODAK - BOILER	09/22/82			
6	GUARDIAN GLASS, GENEVA	4/1/97			X
NIAGARA FRONTIER AQCR					
1	HOOKER - EFW [4]	12/22/78		X	
2	NYSEG - SOMMERSET	05/23/79	X		
3	BUFFALO CRUSHED STONE	07/24/79			
4	ERIE COUNTY SOUTHTOWNS	10/11/79			
5	NABISCO [2]	12/05/79			
6	AIRCON (CARBON/GRAPHITE)	04/30/82			
7	INDECK ENERGY -YERKES	10/13/88			X
8	UDG - NIAGARA	10/14/88			
9	EMPIRE ENERGY - HARRISON	02/22/89			
10	INDECK SILVER SPRINGS - MOD	10/01/93			

NOTES:

X denotes minor source baseline dates

1 Facility not built

2 Facility removed from operation

3 PSD permit rescinded

4 Facility modified (e.g., fuel switch, physical replacement, capped). Contact appropriate NYSDEC Region for details

APPENDIX E

Interpretation of Subpart 231-2 Provisions on Emission Offset Source Location and Net Air Quality Benefit Analysis

NOTE: ***The procedures outlined below were originally formulated based on the 1994 version of Subpart 231-1. Several amendments were made to Subpart 231-2 since the 1994 version and this appendix has been updated to reference the correct sections of current Subpart 231-2, adopted on 5/3/00. This regulation is currently under revision to address federal NSR regulations. When the revised pertinent sections are finalized, the guide will be revised to reflect the new sections. In addition, any revision to the specific requirements for the $PM_{2.5}$ standards will be addressed at that time. Furthermore, it should be noted that the 8-hour ozone standard became effective on 6/15/04 in New York and the 1-hour standard was revoked by EPA on 6/15/05. However, until the regulatory requirements and nonattainment area definitions of Parts 200 (referenced in Subpart 231-2) are modified to correspond to this change, the procedures outlined below for nonattainment areas based on the 1-hour ozone standard should be used to determine appropriate offset source areas. Lastly, recommendations for the $PM_{2.5}$ nonattainment area requirements are based on the approach previously developed for PM_{10} and EPA's regulations at Appendix S of 40 CFR, Part 51.***

This appendix provides clarification and guidance on impact analysis terms and requirements for proposed projects in ozone and PM_{10} nonattainment areas and the Ozone Transport Region (OTR), as contained in Part 200 and Subpart 231-2. In particular, the "contribution" test for the area of the VOC and NO_x offsetting sources in Section 231-2.9 and the PM_{10} "net air quality benefit, on balance," test of Section 231-2.9 will be described using current nonattainment classification areas, and EPA guidance documents and policy determinations.

The requirements for the location of offset sources and the performance of an air quality analysis are different for ozone nonattainment areas in the OTR versus the PM_{10} nonattainment areas. Thus, these will be described separately with reference to pertinent sections of Subpart 231-2.

I. **Ozone Nonattainment Areas and OTR:** The New Source Review requirements for the emission offset provisions of the Clean Air Act are contained in Section 173(c) with respect to the location of the offset source and in Section 184(b)(2) with respect to special considerations for nonattainment areas in the Ozone Transport Region (OTR). The corresponding New York State provisions are provided in Subdivision 231-2.9(e). Specifically, in terms of emission trades between different nonattainment areas for the "equal or higher" class criterion (as required in Section 173(c)(1)(A)) and the requirement to show a "contribution" test between the different nonattainment areas (Section 173(c)(1)(B)), initial guidance for the Northeast states was detailed in an EPA OAQPS letter (John Seitz, Director EPA OAQPS), dated March 31, 1993, to the Ozone Transport Commission (Bruce Carhart, Director). In a September 12, 1995 letter from John Seitz to Bruce Carhart, EPA provided a more flexible policy guidance on the "equal or higher" provision which allows the offset trades between "moderate-to-below" nonattainment areas of the OTR as long as the contribution test is met. The policy was further clarified by EPA Region II (letter from Conrad Simon to Arthur Fossa) by extending the NO_x offset policy to VOCs and reiterates EPA's willingness to review "up front" contribution test demonstrations which would eliminate the need for case-by-case demonstrations and would allow for timely processing of offset trades.

Subpart 231-2 reflects the EPA requirements as follows (refer to attached Figure 1a for the 1-hour ozone nonattainment area classifications):

1) For proposed sources to be located in attainment areas, EPA regulation and Paragraph 231-2.9(e)(2) allow the VOC and NO_x offsets to be obtained from any location within the State or OTR (attainment or nonattainment).

2) For proposed sources which obtain offsets from sources within the same nonattainment area, there is no further location condition. This is reflected in Paragraph 231-2.9(e)(1).

3) When the offsets are obtained from a source in a different nonattainment area from that of the proposed sources', then the "equal or higher" and "contributing area test" conditions apply to serious (none in NY) and severe nonattainment areas, but only the "contribution" test must be demonstrated for the moderate-to-below areas per EPA's newer guidance. These are identified in Paragraph 231-2.9(e)(1).

The clarification that is provided herein is with respect to the general "contributing area" test which has been demonstrated to EPA Region II's satisfaction. EPA policy (defined in the March 31, 1993 OAQPS letter and referenced in the September 12, 1995 letter) had proposed a default distance or a case specific test to be made. That is, if the offset source area is within a default upwind distance of 200km (120 miles) from the proposed source location, then the contribution test is met. Alternately, a case-by-case source demonstration is allowed where the offsetting source area is shown to be within two days transport time upwind of the proposed source location. EPA recognized, however, that it has broad discretion in defining the contribution test as long as it is technically supportable.

We formulated one such technique, which recognized the limitations of the EPA default distance, and which resulted from a study of ozone data in the OTR by Rao, et.al, *Determining Temporal and Spatial Variations in Ozone Air Quality*, Journal of Air and Waste Management Association, 1995, V45, pp 57-61) and known wind conditions associated with ozone transport in the Northeast. This alternative scheme (incorporated in previous Air Program Memo 95/94-AIR-52) was submitted to EPA and was determined to be in accord with their requirements. With the new EPA policy guidance on Section 173(c)(1)(A), the technical support document was augmented, in a March 26, 1996 submission to EPA Region II, to demonstrate that the moderate-to-below nonattainment areas of New York can be treated as a "free trade" zone similar to the NO_x Budget process for the Northeast states.

Specifically, the technical documentation included Rao, et. al., study's conclusion that the time scale of ozone transport in the Northeast is two to three days and the spatial scale of the elliptical "ozone cloud" is at least 300 miles in the major axis orientation (SW to NE) and 250 miles in the minor axis orientation (SE to NW). This result was supplemented with "ozone cloud" depictions for specific monitor sites in New York and in neighboring states which indicated that the "ozone clouds" over New York covered the whole State and overlapped with "clouds" centered at other states' monitor sites.

In addition, an analysis of wind direction and speed associated with all ozone episodes in New York from 1988 to 1994 was conducted by NYSDEC Meteorology staff. The analysis indicates a predominant south to west flow pattern, but ozone episodes were also associated with all other general wind direction quadrants. Furthermore, supporting documentation from the 1995 ICF Kaiser Resources study for EPA for the NO_x Budget was cited as a very cost effective means of ozone precursor reductions. Lastly, it was noted that the Upstate New York marginal nonattainment areas were noticed in the Federal Register (40 CFR Part 81, Vol. 59, No. 193, pp 50848-9) as clean air areas and, thus, should be treated the same as attainment areas. A small modification to our proposal for VOC offset trades from the moderate nonattainment area was submitted to EPA Region II in an April 25, 1996 letter (Leon Sedefian to Rick Ruvo).

In a June 3, 1996 letter EPA Region II acknowledged that the complete technical package satisfied the "contribution to a violation" test of Section 173(c)(1)(B) and, thus, any source in Upstate New York can obtain offsets from any part of the State, with a limitation on VOC offsets from the moderate area. Combining this conclusion with our previous approach to offset trades for the severe nonattainment area, resulted in the following guidance:

a) Table 1 identifies all default areas in New York State, by county or attainment status, where a proposed source can obtain NO_x and VOC emission offsets without having to demonstrate the "contribution test"; or, if desired,

b) A case-by-case demonstration can be made that the offset source nonattainment area is within two to three days transport time upwind of the proposed source location during ozone episodes in the latter's nonattainment area. Part of that demonstration could rely on the "ozone cloud" depiction in Figure 2 (with proper scaling) which resulted from the aforementioned study by Rao et. al., and was used in our previous guidance document. Prior to submission of an alternate technical demonstration package consistent with other Subpart 231-2 submission requirements, a protocol must be submitted for review and concurrence.

Furthermore, if an approved interstate agreement for offset trading is established, then the guidance above can also serve to identify the contributing areas with equal or higher nonattainment classification. To that end, a scaled Figure 2 can be applied to the centroid of the nonattainment area of the proposed source to identify the acceptable offset source nonattainment areas.

For the 8-hour ozone standards, Table 2 was generated following the same procedures accepted by EPA for the Table 1 areas. This was possible because of the similarity in the areas which remain in nonattainment of the 8-hour standards. Table 2 should be used instead of item (a) above when the 8-hour NAAQS are promulgated in NYS regulations. Item (b) and the application of Figure 2 for any interstate agreements will still be applicable for the 8-hour NAAQS.

II. ***PM_{10}* and $PM_{2.5}$ Nonattainment Areas:** The nonattainment area for PM_{10} is confined to Manhattan (New York County) which is not depicted here. The $PM_{2.5}$ nonattainment areas identified by EPA on 4/5/05 are depicted in Figure 3, with all areas having the same classification. Thus, the location conditions defined in Subdivision 231-2.9(d) reduce simply to the need to obtain emission offsets from these same nonattainment areas. However, for $PM_{2.5}$ offsets, a distinction has to be made between direct emissions of $PM_{2.5}$ and its precursors. EPA has proposed SO_2 and NO_x as national "default" precursors to $PM_{2.5}$ formation, but a final determination has yet to be made. For any $PM_{2.5}$ precursors promulgated by EPA or New York, the offset requirements will be deemed satisfied by obtaining emission reductions of the same precursor from sources in any portion of the New York nonattainment area depicted in Figure 3. In addition and similar to item (b) above for the ozone precursors, a case-by-case demonstration can be made by an applicant for precursor emission offsets from sources outside of New York State following procedures to be reviewed and approved by NYSDEC staff.

For the direct PM_{10} and $PM_{2.5}$ emissions and in addition to the location condition, Section 231-2.9 requires (for PM_{10} and, thus, for $PM_{2.5}$) that a modeling analysis be conducted to demonstrate a "net air quality benefit" by the emission offsets using two criteria: first, the net impacts from the proposed source, minus the offset source impacts, provide a benefit, on balance, in the area affected by the proposed source; and second, the net impacts are below applicable significance levels of Table 1 of Section 231-2.11 for PM_{10} **(for $PM_{2.5}$, EPA is in the process of formulating similar levels which can be used when adopted).**

The concepts to be clarified here for identifying proper direct PM_{10} and $PM_{2.5}$ offsets are "net impacts," "on balance," and "the affected area". General guidance on these criteria are taken from 40CFR51, Appendix S and EPA's *Draft 1990, New Source Review Workshop Manual*. It should be recognized that, in accord with Appendix S criteria, the net air quality benefit analysis is met, by default, in instances where the offset source and the proposed source have the same effective stack height and are in proximity of each other.

To provide a showing of net air quality benefit, it is recommended that the proposed source first submit a modeling protocol to the Impact Assessment and Meteorology staff for concurrence before a model demonstration is undertaken. The protocol should address the specific items discussed below, incorporating other applicable guidance on modeling procedures. This procedure will assure that the case-by-case showing of net air quality benefit proceeds objectively. The emissions data to be used in the modeling have to be reviewed and accepted by the regional staff before the modeling exercise is finalized and an analysis report submitted for review.

1) Net Impact Calculations: For permitting purposes, sources in the nonattainment areas must address the 24-hour and annual PM_{10} and/or $PM_{2.5}$ averages, as applicable to the case. Thus, net impacts have to be calculated for these pollutants and the above averaging times using the maximum allowable emission rate for the proposed source, and the actual emission rate for the offsetting source. For the proposed source, the annual rate can be a federally enforceable long term limit. For the offsetting sources, the average emission rate for annual impacts is calculated the same way as the annual average for the emission offset requirements. However, for the 24-hour impacts, the annual average emissions will likely underestimate the "impact credit" provided by the offsetting source. Thus, a maximum actual emission rate should be used in these averages. This is defined as the most common (or normal) maximum operating level for the averaging time, as documented for the offset source over the period of the last two years of representative operations data.

The net impact is then calculated simply as the proposed source's impact minus the offset source's impact at each receptor for the appropriate pollutant and averaging times.

2) Net Benefit, On Balance, and Affected Area (Section 231-2.9): These criteria are interrelated since the net benefit in impacts has to be demonstrated over the area affected by the proposed source. This area should include all locations where the proposed source has a significant impact, as defined in Table 1 of Section 231-2.11 for PM_{10} and levels yet to be developed by EPA for $PM_{2.5}$. In many instances the proposed source may not have significant impacts or a larger area than the significant impact area (SIA) is desirable for the net benefit analysis. For example, receptors should also be placed around the offset source, as well as in areas on monitored standard violations. In all instances, the receptor areas should be explained and included in the modeling protocol.

Once the receptor grid is defined, the net air quality benefit demonstration should be achieved, on balance, over this area. This means that net impacts must be less than zero generally over the portion of the grid that is most affected by the proposed source (e.g., its SIA). However, the net impacts need not be less than zero at all receptors, nor over a majority of the total set of receptors. A further criterion for net benefit in the latter situation could be that the average net impact over the grid is less than zero.

In addition to the net benefit analysis, Paragraph 231-2.9(d)(2)(ii) requires that the net PM_{10} impacts be less than significance levels of Table 1 at all of the receptors over the grid chosen **(Note: EPA is yet to develop and adopt significance levels for $PM_{2.5}$)**. This requirement is a carryover from the previous Part 231 regulations.

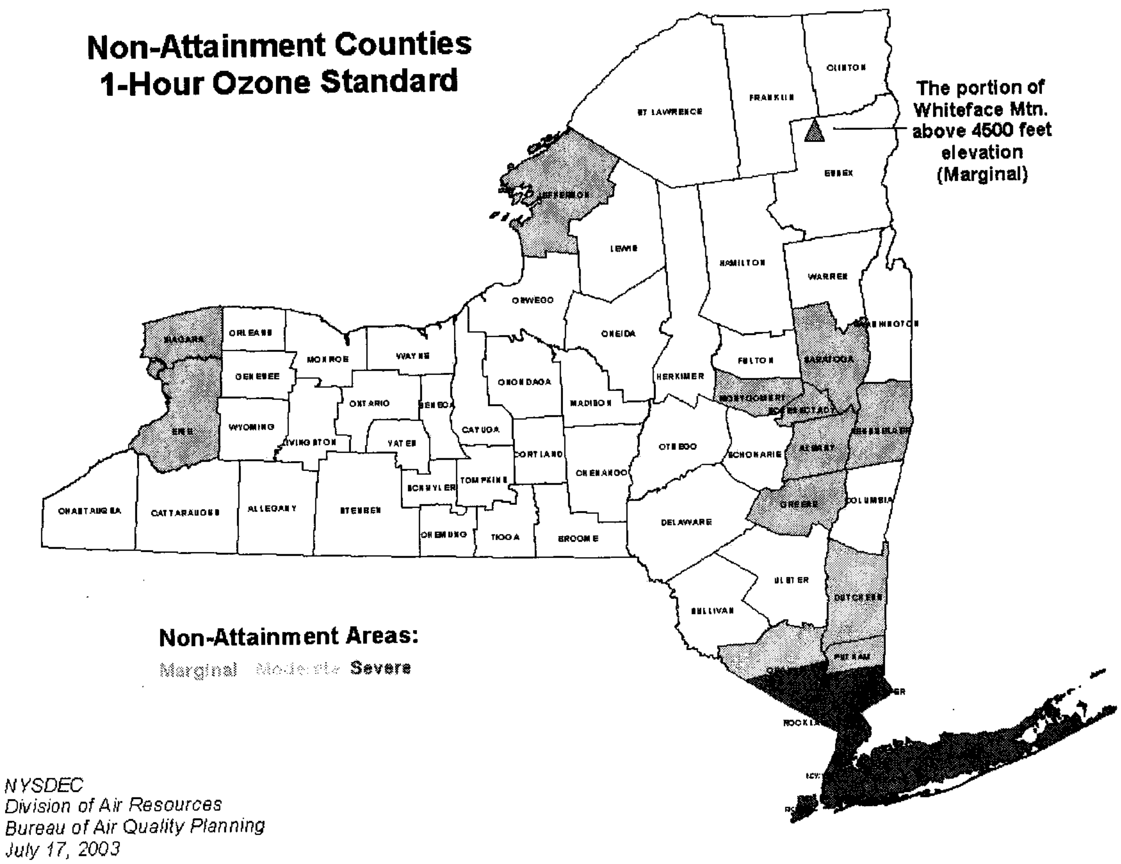


Figure 1a--Ozone Attainment Status Based on the 1-Hour Standard

8-Hour Ozone NAAQS Nonattainment Areas

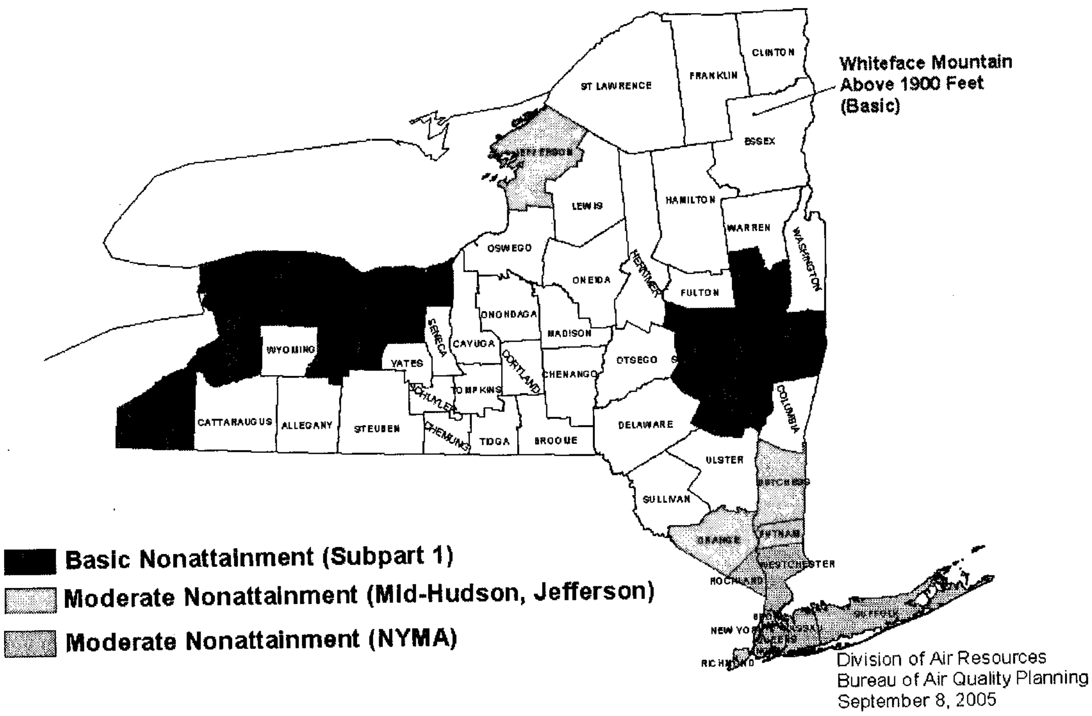


Figure 1b--Ozone Attainment Status Based on the 8-Hour Standard

Table 1

Default Acceptable NO_x and VOC Offset Source Areas for Proposed Sources in New York State Based on the 1-Hour Ozone Nonattainment and Attainment Areas (for OTR)

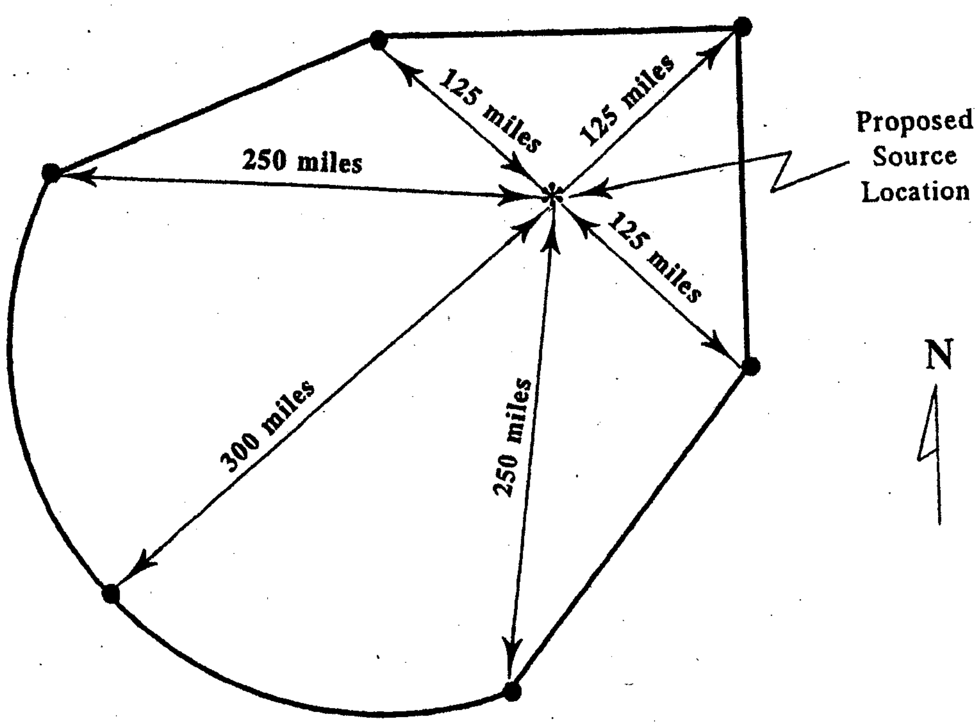
Proposed Source's location in a Nonattainment or Attainment Area	**Appropriate NO_x Offset Source Locations**	**Appropriate VOC Offset Source Locations**
Attainment Area	All of New York State	All of New York State
Marginal nonattainment areas in Niagara-Erie Counties, Jefferson County, and Capital District Counties	All of New York State	All of New York State
Moderate Nonattainment area in Dutchess, Putnam and Orange Counties (excluding LOCMA)	All of New York State	All counties and areas in New York State with Moderate and Severe Nonattainment Classification
Severe nonattainment areas in Rockland, Westchester, LOCMA, New York City, Nassau, and Suffolk Counties	All counties and areas in New York State with Severe Nonattainment Classification	All counties and areas in New York State with Severe Nonattainment Classification

TABLE 2

Default Acceptable NOx and VOC Offset Source Areas for Proposed Sources in New York State Based on the 8-Hour Ozone Nonattainment and Attainment Areas (for OTR)

Proposed Source's Location in a Nonattainment or Attainment Area	Appropriate NO_x Offset Source Location	Appropriate VOC Offset Source Locations
Attainment Area	All of New York State	All of New York State
Basic nonattainment areas in Capital District, Buffalo-Niagara Falls, Essex County, Jamestown and Rochester Areas	All of New York State	All of New York State
Moderate Nonattainment areas in Mid Hudson-Poughkeepsie areas	All of New York State	All counties and areas in New York State with Moderate Nonattainment Classification, except Jefferson County
Moderate nonattainment areas in Rockland, Westchester, New York City Boroughs, Nassau, and Suffolk Counties	All of New York State	All counties and areas in New York State with Moderate Nonattainment Classification, except Jefferson County
Moderate nonattainment areas in Jefferson County	All of New York State	All counties and areas in New York State with Moderate Nonattainment Classification

Figure 2
Area Around Proposed Source Where Offset Can Be Located



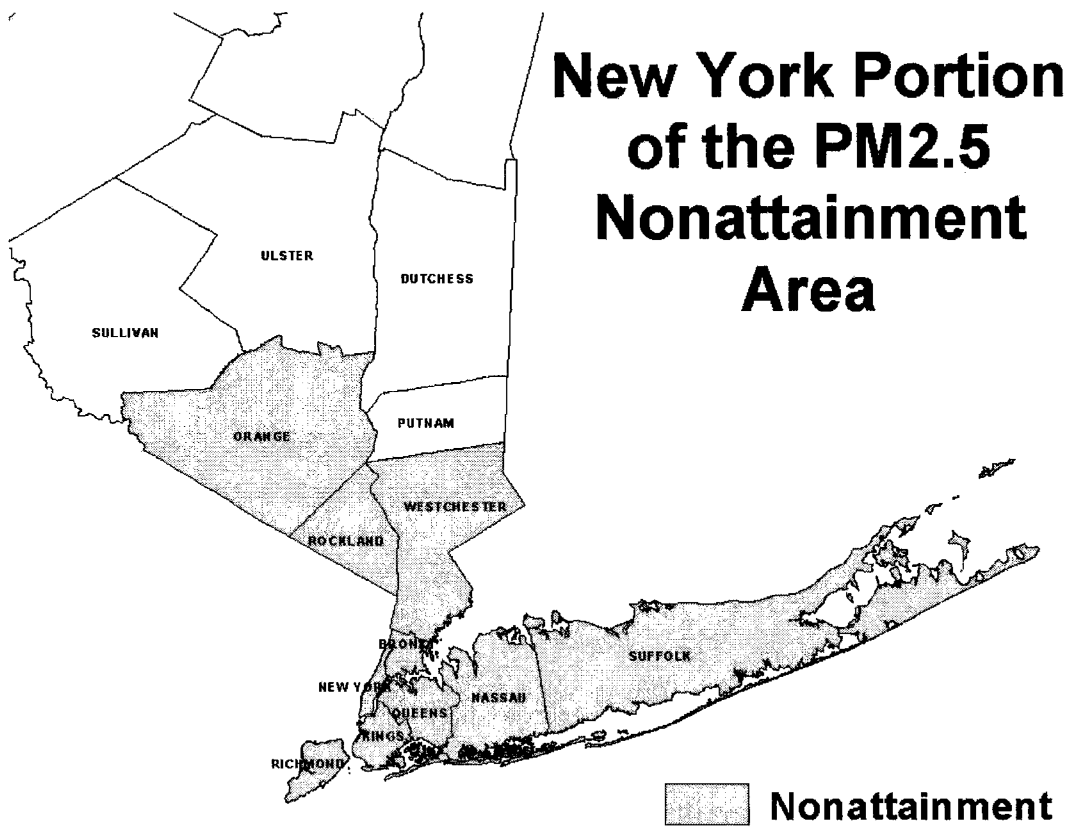


Figure 3–$PM_{2.5}$ Nonattainment Areas in New York

Attachment D

CTDEP INTERIM PM2.5 NEW SOURCE REVIEW MODELING POLICY AND PROCEDURES

Policy Considerations

Effective December 15, 2006, the U.S. Environmental Protection Agency (EPA) revised the national ambient air quality standards (NAAQS) for particulate matter less than 2.5 microns (PM2.5), retaining the annual standard of 15 $\mu g/m^3$ and tightening the 24-hour average to 35 $\mu g/m^3$. Connecticut has monitored ambient levels of PM2.5 considerably higher than 35 $\mu g/m^3$, a concern as the revised standard is set to better protect public health. While EPA has not yet fully provided implementation rules or guidance for these revised standards, the Connecticut Department of Environmental Protection (CTDEP) is developing strategies and implementing procedures to better protect public health and to help provide for attainment of both the 1997 and 2006 revised PM2.5 NAAQS.

This interim policy describes CTDEP's requirements for new source review (NSR) permitting and modeling for sources of PM2.5. In particular, for permit applications subject to this policy, a demonstration of compliance with the PM10 NAAQS will no longer serve as a surrogate for compliance with the PM2.5 NAAQS. Instead, NSR permit applicants must consider PM2.5 as a criteria pollutant and address it in preparing an application. These interim procedures will serve the policy goal of public health protection by minimizing PM2.5 ambient air impacts from new stationary sources, particularly in Fairfield and New Haven Counties, which are designated as nonattainment for PM2.5.

This interim policy applies immediately to applications for NSR permits or modifications for which a tentative determination has not been issued. These procedures will be in effect until CTDEP adopts a regulation, a State Implementation Plan revision, or a revised policy addressing the PM2.5 NAAQS.

New Source Review Permitting

Except as noted below, this policy applies a "business as usual" approach to taking PM2.5 into account in CTDEP NSR technology reviews and any necessary requirements to reduce PM2.5 impacts.

Nonattainment review. Although EPA has not yet made designations of nonattainment for the 2006 24-hour PM2.5 NAAQS, Fairfield and New Haven Counties are designated as nonattainment for the 1997 annual PM2.5 NAAQS. The remainder of Connecticut is currently designated as attainment for PM2.5. Permit applicants should assume that these geographic boundaries would also apply to the 2006 24-hour PM2.5 NAAQS. See Figure 1 for a map of the assumed designations. New major stationary sources in nonattainment areas are required by the Clean Air Act to install technology deemed to produce the lowest achievable emission rate (LAER). Also, new major stationary sources and major modifications are required to offset emissions increases at a ratio of at least 1:1 from other sources located in the nonattainment area. Since SO_2 is a precursor to PM2.5, offsetting emissions of SO_2 at a greater than 1:1 ratio may be substituted for PM2.5 on a case-by-case basis. The source must provide a sound technical justification, which demonstrates that any proposed SO_2 offset will provide a net air quality benefit equal to or greater than a 1:1 PM2.5 offset.

PM2.5 emission limits. A permit applicant may assume PM2.5 emissions are equivalent to PM10 emissions or propose a PM2.5-specific emission limit based on supporting data. Applications should include separate emission estimates for filterable and condensable fractions of expected total PM2.5 emissions. Sources will be required to meet the filterable fraction using appropriate EPA reference stack test methods. A source will not be required to demonstrate compliance with an expected condensable emission limit until one year after the U.S. EPA promulgates a new reference stack test method for the condensable fraction. At that time, the PM2.5 emissions will be evaluated and the permit will be modified to reflect the results of the stack test for condensables.

New Source Review Modeling

Applications for new sources with potential PM2.5 emissions in excess of 15 tons per year must include an adequate PM2.5 modeling analysis to demonstrate compliance with both the PM2.5 NAAQS of 15 $\mu g/m^3$ (annual average) and 35 $\mu g/m^3$ (24-hour average). CTDEP's modeling procedures typically used in the NSR application process are unchanged, except for the addition of PM2.5 as a pollutant to be assessed. The procedures for different source situations are summarized in Figure 2. The specific criteria to apply in performing a PM2.5 modeling demonstration are described below.

Applicability thresholds. The modeling applicability thresholds apply to any new stationary source or modification subject to the provisions of sections 22a-174-2a and 22a-174-3a of the Regulations of Connecticut State Agencies (R.C.S.A.), including:

- New major PM2.5 sources (100 tons per year or more);
- Proposed modifications to existing major PM2.5 sources (100 tons per year or more) with a PM2.5 net emissions increase of equal to or more than 15 tons per year; and
- New minor sources or modifications with a proposed PM2.5 net emissions increase greater than 15 tons per year but less than 100 tons per year.

Any new source or modification that is required to receive a NSR permit, with a net PM2.5 emission increase of $\geq$ 3.0 tpy but $<$ 15 tpy, should follow existing screening modeling procedures for PM. PM10 emissions can be used as a surrogate for PM2.5.

Background air quality. CTDEP's existing ambient PM2.5 monitoring network may be used to estimate background PM2.5 levels for all locations in Connecticut. The annual background PM2.5 value should be based on the average of the most recent three years of available data. The 24-hour background PM2.5 value should be based on the average of the 98^{th} percentile 24-hour values measured over the last three years of available data. An applicant may choose to develop a more refined background PM2.5 value by performing a full year of on-site pre-construction monitoring. CTDEP may allow an applicant to define background values that are less than the observed design values, provided that the applicant provides sound technical reasoning for such an approach (e.g., a directional-specific analysis of monitored levels).

Ambient air quality modeling. Applications requiring air quality modeling must demonstrate expected compliance with the PM2.5 NAAQS based on a total expected PM2.5 emission rate that includes both filterable and condensable PM2.5.

When calculating impacts for comparison to the annual NAAQS of 15 $\mu g/m^3$, the maximum three-year average of annual PM2.5 predicted impacts from the new source at each receptor over the five years modeled should be added to the monitored background concentration. When calculating impacts for comparison to the 24-hour NAAQS of 35 $\mu g/m^3$, the three-year average of the yearly maximum 8^{th} high 24-hour PM2.5 predictions at each receptor should be added to the monitored background concentration and the result compared to the NAAQS.

CTDEP is adopting the PM2.5 significant impact levels (SILs) recommended by the Northeast States for Air Use Management (NESCAUM) of 0.30 $\mu g/m^3$ (annual average) and 2.0 $\mu g/m^3$ (24-hour average). Background information regarding the selection of these SILs is available at http://www.nescaum.org/topics/permit-modeling.

Questions concerning the PM2.5 modeling procedures should be directed to Jude Catalano at 860-424-3384 or jude.catalano@po.state.ct.us. The regulations that apply to NSR permitting, namely R.C.S.A. sections 22a-174-2a and 22a-174-3a, are available at: http://www.ct.gov/dep/cwp/view.asp?a=2684&q=322184&depNav_GID=1619.

Gina McCarthy
Commissioner, CTDEP

8/21/07
Date

Figure 1. PM2.5 nonattainment area boundaries for the 24-hr NAAQS are likely to be the same as for annual NAAQS.

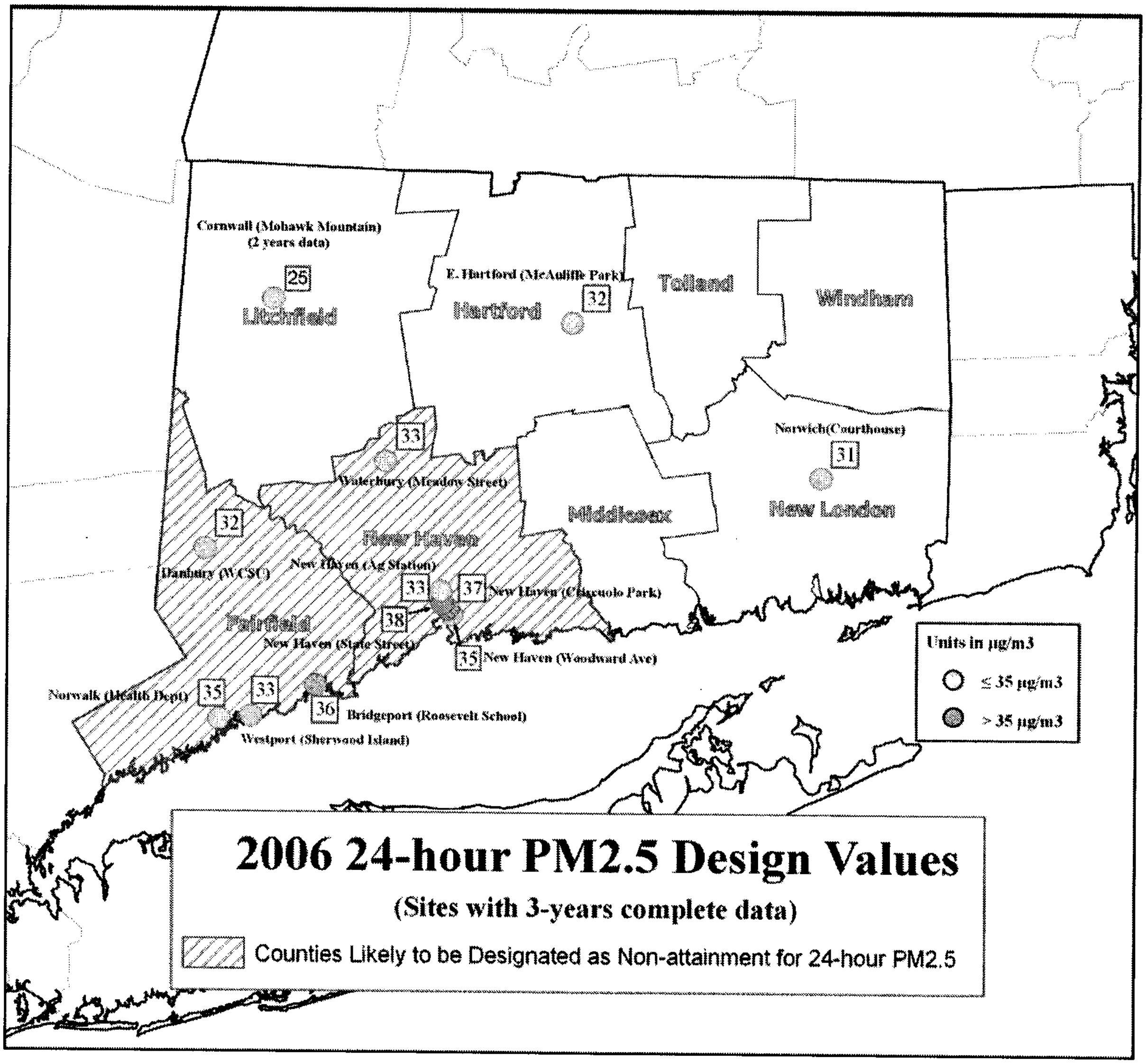
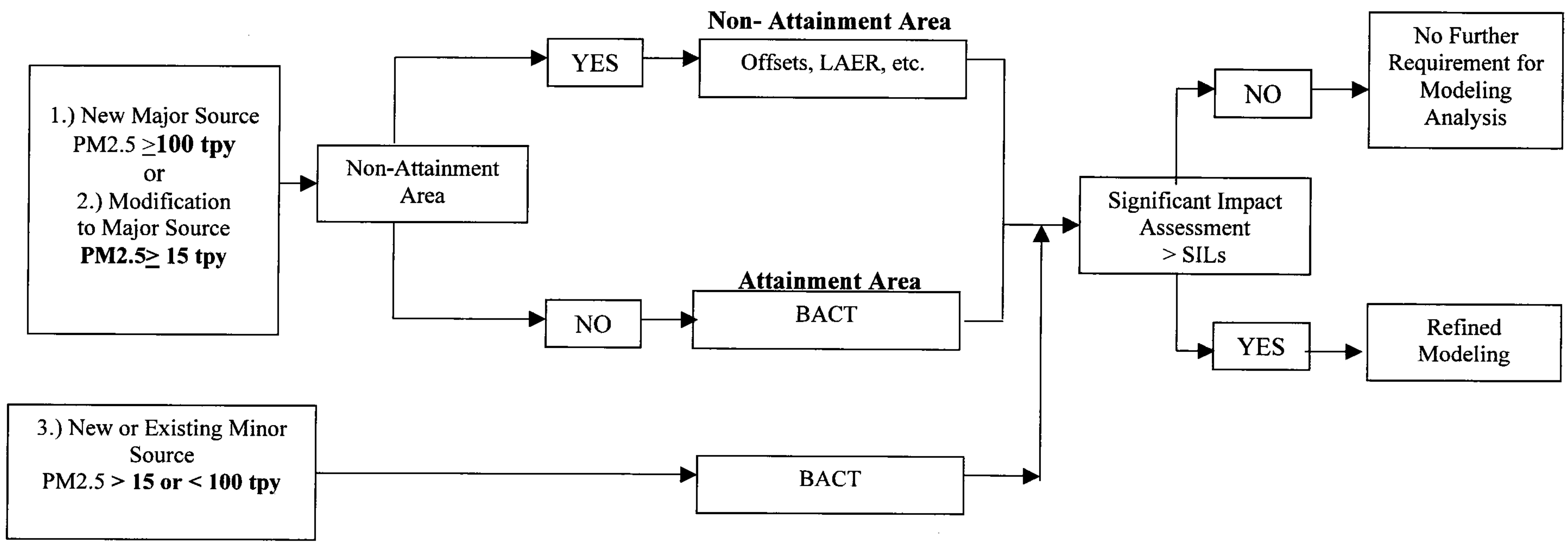


Figure 2. PM-2.5 NSR FLOW DIAGRAM



Attachment E-1

TRC

21 Griffin Road North
Windsor, CT 06095

July 16, 2007

Mr. Jude J. Catalano
5th Floor, Engineering & Enforcement
Bureau of Air Management
Department of Environmental Protection
79 Elm Street
Hartford, CT 061065127

Re: **Attachment J – Modeling Report**
Permit Application Supplement
Kimberly-Clark Corporation - New Milford Mill
Combined Heat and Power Project
TRC Project No. 114781 (formerly 54605)

Dear Mr. Catalano:

On behalf of the Kimberly-Clark Corporation (KCC), TRC is submitting this supplemental information to the February 2007 New Source Review permit application for the proposed Combined Heat and Power Project (the Project) at KCC's New Milford Mill. This submittal to the air permit application constitutes Attachment J, which describes the ambient impact analyses that have been performed in support of the Project.

The air permit application was submitted without the required ambient impact analyses pending Connecticut Department of Environmental Protection (DEP) approval of the emission rates, control technologies and other aspects of the Project that were presented in the air permit application, plus the Modeling Protocol submitted in March 2007.

The dispersion modeling analyses presented in the attached report were performed in accordance with DEP's Ambient Impact Analysis Guideline and the DEP-approved Modeling Protocol. The modeling results demonstrate that the proposed operation of the Project will produce insignificant air quality impacts that will not interfere with the attainment and maintenance of compliance with the Connecticut and National Ambient Air Quality Standards (CAAQS/NAAQS) and Prevention of Significant Deterioration (PSD) increments for the applicable pollutants.

Thank you in advance for your cooperation in undertaking a timely review of the subject modeling analyses and report to facilitate issuance of a tentative determination to approve the air permits for this important Project that will save energy and reduce the actual emissions of air pollutants, both locally and regionally.

Very truly yours,

TRC

Michael K. Anderson

Michael K. Anderson, QEP
Principal Consulting Scientist

Cc: Dave LaRiviere, DEP
Stephen Belanger, KCC
Rob Marcotte, KCC
Steve Eitelman, TRC

TRC

TRC

Customer-Focused Solutions

MODELING REPORT IN SUPPORT OF THE KIMBERLY-CLARK CORPORATION

NEW MILFORD MILL COMBINED HEAT AND POWER PROJECT

Prepared for

Kimberly-Clark

Kimberly-Clark Corporation
New Milford Mill
New Milford, Connecticut

Prepared by

TRC

Windsor, Connecticut

July 2007

TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	1-1
1.1	Site Description	1-1
1.2	Project Overview	1-1
1.3	Overview of Regulatory Requirements	1-5
1.4	Approach Overview	1-5
2.0	PROJECT DESCRIPTION	2-1
3.0	MODELING METHOD	3-1
3.1	Model Selection	3-2
3.2	Model Set-up	3-3
3.3	Good Engineering Practice (GEP) Stack Height Analyses	3-3
3.4	Receptor Array	3-4
3.5	Meteorological Input Data	3-5
3.6	Source Inventory and Emissions Data	3-15
4.0	MODELING RESULTS	4-1
5.0	SUMMARY AND CONCLUSIONS	5-1

TABLE OF CONTENTS
(Continued)

FIGURES PAGE

1-1: Location Map of Kimberly-Clark New Milford.... 1-2
1-2: Site Plan.... 1-3
1-3: Stack Locations.... 1-4
3-1: Near-Field Receptor Array.... 3-6
3-2: Far-Field Receptor Array.... 3-7
3-3: Land Cover for the Kimberly-Clark New Milford Site.... 3-9
3-4: Land Cover for the Bradley Airport.... 3-10
3-5: Bradley Airport Windrose (1987-1991).... 3-14

TABLES PAGE

1-1: Net Emission Change Attributable to Project.... 1-6
1-2: Connecticut or National Ambient Air Quality Standards.... 1-7
1-3: Allowable PSD Increments.... 1-8
1-4: Significance Levels for Air Quality Impacts.... 1-9
3-1: Threshold Emission Rates for Dispersion Modeling Requirements in Connecticut.... 3-1
3-2: Correspondence of Land Cover Dataset to Aermet Land Uses.... 3-11
3-3: Seasonal Determination for Bradley Airport 1987-1991.... 3-12
3-4: Comparison of Calculated Albedos and Bowen Ratios for the Bradley Airport and the Project Site.... 3-12
3-5: Comparison of Calculated Surface Roughness for the Bradley Airport and the Project Site.... 3-13
3-6: Existing Air Emissions Inventory for the Kimberly Clark New Milford Mill.... 3-16
3-7: Operating Scenarios and Stack Parameters for the Combined Heat and Power Project.... 3-17
4-1: Maximum Predicted Single-Source Sulfur Dioxide Impacts.... 4-2
4-2: Maximum Predicted Single-Source Nitrogen Dioxide Impacts.... 4-3
4-3: Maximum Predicted Single-Source PM_{10} Impacts.... 4-4
4-4: Maximum Predicted Single-Source $PM_{2.5}$ Impacts.... 4-5
4-5: Maximum Predicted Single-Source Carbon Monoxide Impacts.... 4-6

APPENDIX

A MODELING INPUT/OUTPUT FILE (CD-ROM)

1.0 INTRODUCTION

Kimberly-Clark Corporation (KCC) proposes to construct and operate a combined heat and power project at the existing New Milford Mill at 58 Pickett District Road, New Milford, CT. The location of the proposed project is illustrated on the United States Geological Survey (USGS) topographical map of the area provided in Figure 1-1. KCC has retained TRC to assist with the evaluation of potential ambient air quality impacts of the project as required by the permitting process. KCC and TRC have prepared this modeling report to evaluate air emissions from the proposed project and to demonstrate that its potential net air quality impacts will comply with ambient air quality standards, regulations and guidance.

This report is being submitted to the Connecticut Department of Environmental Protection (CTDEP) for review and approval.

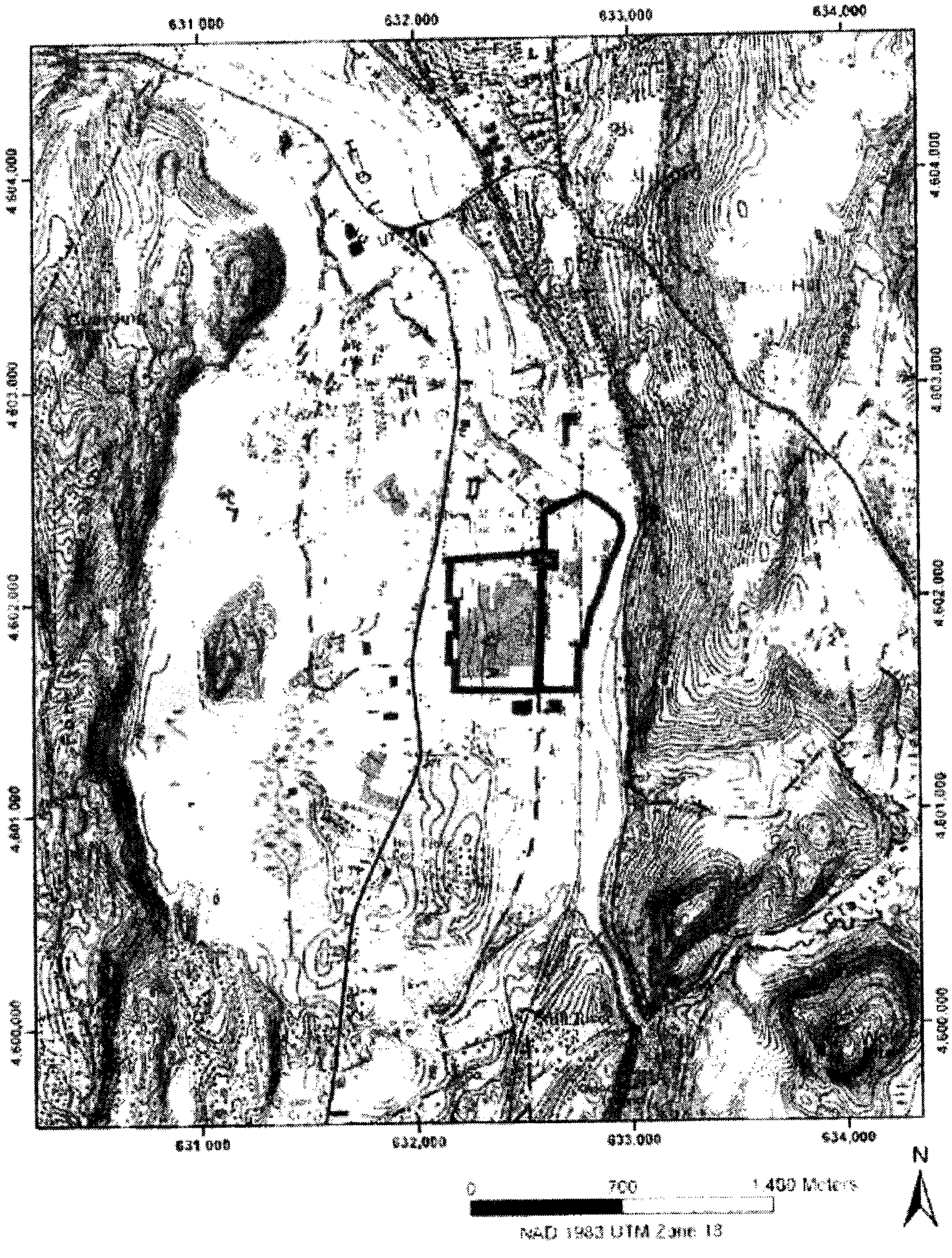
1.1 Site Description

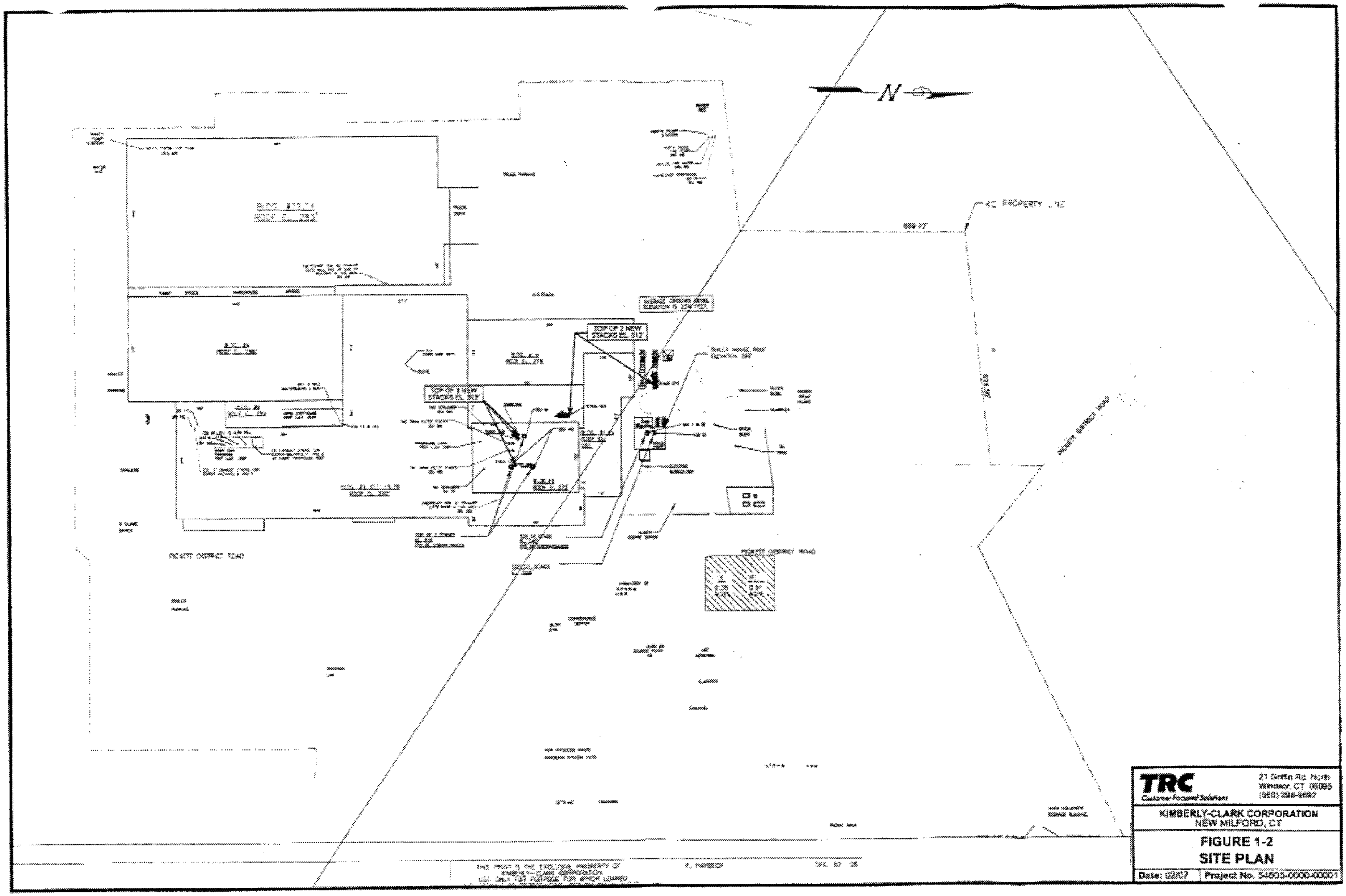
The New Milford Mill is located on Pickett District Road in New Milford, CT at approximately 41°33.5'N, 73°24.5'W. The site is located adjacent to the Housatonic River in an industrial area. The region is generally rural and forested with rolling terrain. Figure 1-2 provides a site plan for the New Milford Mill, and Figure 1-3 provides a closer view of the proposed project location.

1.2 Project Overview

The New Milford Mill is a consumer product manufacturing facility providing family care products. The project will include two combustion turbines fired exclusively with natural gas. KCC is proposing that the turbines will have a nominal rating of approximately 14.3 megawatts (MW) each at International Standards Organization (ISO) conditions. Combustion Turbine #1 (CT#1) will be designed to operate as a combined-cycle unit that can also utilize a natural gas-fired supplemental burner with a heat recovery boiler and a steam turbine to generate electricity. Combustion Turbine #2 (CT#2) will be designed to operate as a simple-cycle unit to generate electricity. As part of the project, KCC is proposing to replace four existing Tissue Machine Hood burners with low nitrogen oxides (NO_x), natural gas-fired burners having a maximum heat input rating of 15 million British thermal units per hour (MMBtu/hr) each.

Figure 1-1: Location Map of Kimberly-Clark New Milford



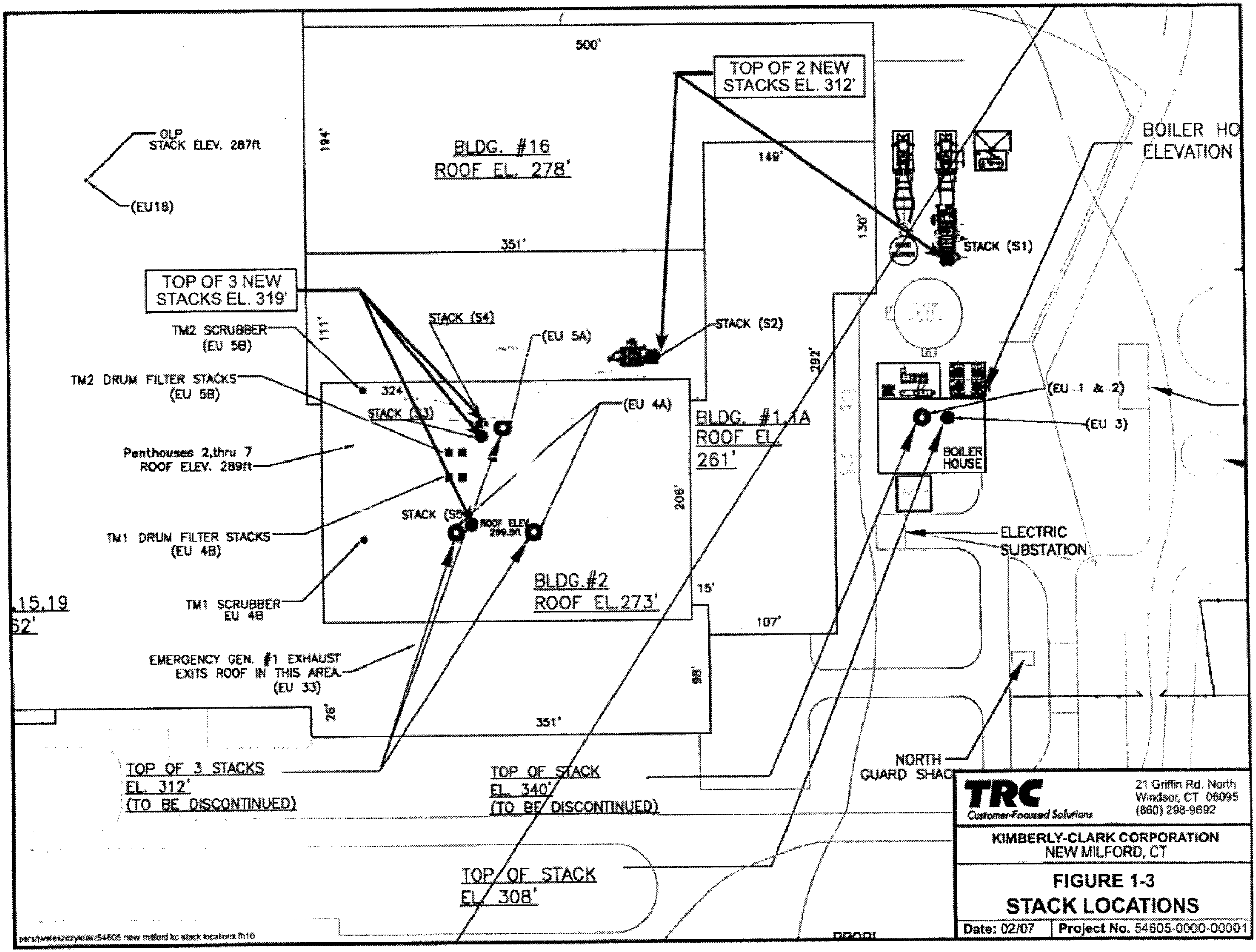


TRC Customer-Focused Solutions
21 Griffin Rd. North
Windsor, CT 06095
(860) 298-9692

KIMBERLY-CLARK CORPORATION
NEW MILFORD, CT

FIGURE 1-2
SITE PLAN

Date: 02/07 | Project No. 54505-0000-00001



TOP OF 2 NEW STACKS EL. 312'
BOILER HO ELEVATION
OLP STACK ELEV. 287ft
(EU18)
BLDG. #16 ROOF EL. 278'
500'
194'
351'
149'
130'
STACK (S1)
TOP OF 3 NEW STACKS EL. 319'
TM2 SCRUBBER (EU 5B)
TM2 DRUM FILTER STACKS (EU 5B)
Penthouses 2,thru 7 ROOF ELEV. 289ft
TM1 DRUM FILTER STACKS (EU 4B)
TM1 SCRUBBER EU 4B
EMERGENCY GEN. #1 EXHAUST EXITS ROOF IN THIS AREA. (EU 33)
STACK (S4)
(EU 5A)
STACK (S2)
STACK (S3)
STACK (S5)
ROOF ELEV. 299.5ft
(EU 4A)
111'
324
292'
208'
BLDG. #1,1A ROOF EL. 261'
BLDG.#2 ROOF EL.273'
15'
107'
98'
28'
351'
(EU 1 & 2)
(EU 3)
BOILER HOUSE
ELECTRIC SUBSTATION
NORTH GUARD SHAC
TOP OF 3 STACKS EL. 312' (TO BE DISCONTINUED)
TOP OF STACK EL. 340' (TO BE DISCONTINUED)
TOP OF STACK EL. 308'
TRC Customer-Focused Solutions
21 Griffin Rd. North Windsor, CT 06095 (860) 298-9692
KIMBERLY-CLARK CORPORATION NEW MILFORD, CT
FIGURE 1-3 STACK LOCATIONS
Date: 02/07
Project No. 54605-0000-00001

Table 1-1 presents the net emissions changes for the proposed project and details of the project emissions can be found in Attachment E of the permit application. The proposed project will not be a major modification because the net emissions increases will be less than the levels of significance defined by the regulations. The netting analysis included the proposed decommissioning of two boilers and replacement of the Tissue Machine Hood burners as part of the project, and the prior removal of seven diaper lines.

1.3 Overview of Regulatory Requirements

The Regulations of Connecticut State Agencies (RCSA), Section 22a-174-3a set out New Source Review (NSR) permit requirements for sources of air pollution. Under this Section, a permit to construct and operate is required for any new major source, major modification, or new stationary source whose potential emissions of any air pollutant exceeds 15 tons per year (tpy), or modification whose potential emissions of any air pollutant exceeds 15 tpy [Section 22a-174-3a(a)(1)(D)]. The regulation also requires a demonstration of compliance with the Connecticut and National Ambient Air Quality Standards (CAAQS/NAAQS) and Prevention of Significant Deterioration (PSD) increments for all such sources prior to the issuing of any required permits to construct and/or operate [Section 22a-174-3a(d)(3)(B)]. Additional CTDEP modeling guidance requires analyses of certain particulate matter (PM) and sulfur dioxide (SO_2) sources emitting 3 to 15 tpy, NO_x sources emitting 5 to 40 tpy and carbon monoxide (CO) sources emitting 5 to 100 tpy.

CAAQS/NAAQS have been defined for the following nine pollutants: SO_2, nitrogen dioxide (NO_2), PM_{10} (particulate matter less than or equal to 10 μm in size), $PM_{2.5}$ (particulate matter less than or equal to 2.5 μm in size), CO, hydrocarbons (HC), ozone (O_3), lead (Pb), and dioxins. The CAAQS/NAAQS levels are shown in Table 1-2. PSD increments have been defined for SO_2, PM_{10} and NO_2; the values are shown in Table 1-3.

1.4 Approach Overview

This report documents the modeling inputs, assumptions, and methods used to perform the modeling compliance analyses. The following sections discuss the selection of appropriate models, databases, and operating scenarios, as well as the use of the models and input data to predict impacts at appropriate ambient air receptors.

Table 1-1:
Net Emission Change Attributable to Project

Pollutants	Net Difference for Project (tons/year)	Significance Threshold* (tons/year)
PM_{10} (inc. S convr)	9.43	15
$PM_{2.5}$ (inc. S convr)	9.44	15
SO_2	1.17	40
CO	29.7	100
VOC	4.81	25
NO_x	18.5	25

*Significance thresholds as presented in RCSA Section 22a-174-3a, Table 3a(k)-1.

Table 1-2:
Connecticut or National Ambient Air Quality Standards
(CAAQS/NAAQS)

Pollutant	Averaging Time	Exceedance Criteria	Standard[a] ($\mu g/m^3$)
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	b	80
	24-Hour	c	365
	3-Hour	c	1,300
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	b	100
Particulate Matter ≤10 µm (PM_{10})	Annual Arithmetic Mean	d	50
	24-Hour	e	150
Particulate Matter ≤2.5 µm ($PM_{2.5}$)	Annual Arithmetic Mean	f	15
	24-Hour	g	35
Carbon Monoxide (CO)	8-Hour	c	10,000
	1-Hour	c	40,000
Hydrocarbons	3-Hour	c, h	160
Ozone (O_3)	1-Hour	i	235
	8-Hour	j	150
Lead (Pb)	3-Month	b	1.5
Dioxins	Annual	b	1×10^{-6}
	8-Hour	b	7×10^{-6}

a. The lower concentration of either the primary or secondary CAAQS or NAAQS.
b. The standard may not to be exceeded.
c. The standard may not to be exceeded more than once a year.
d. The arithmetic mean of the prior three calendar years may not exceed the standard.
e. The fourth highest concentration in the prior three calendar years may not exceed the standard.
f. The three-year arithmetic mean of concentrations from single or multiple community-oriented monitors may not exceed the standard.
g. The 98th percentile of the measured concentrations may not exceed the standard.
h. Based on measurements between 6 am to 9 am.
i. The standard may not to be exceeded more than once a year, on average.
j. The three-year average of the annual fourth-highest daily maximum 8-hour average may not exceed the standard.

Table 1-3:
Allowable PSD Increments

Pollutant	Averaging Time	PSD Increment ($\mu g/m^3$)		
		Class I	Class II	Class III
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean[a]	2	20	40
	24-Hour[b]	5	91	182
	3-Hour[b]	25	512	700
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean[a]	2.5	25	50
Particulate Matter ≤10 µm (PM_{10})	Annual Arithmetic Mean[a]	4	17	34
	24-Hour[b]	8	30	60

a. Not to be exceeded
b. Not to be exceeded more than once a year.

On November 9, 2005, the U.S. Environmental Protection Agency (EPA) published the revised *Guideline on Air Quality Models* (40 CFR 51, Appendix W, FR, Vol. 70, No. 216, pg 68218-68216, November 9, 2005) which provides guidance and recommends specific air dispersion models for use in assessing potential air quality impacts. Under the revised guideline, the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) replaces the Industrial Source Complex-Short Term model, Version 3 (ISCST3) for regulatory modeling applications and ISCST3 is no longer supported by EPA. AERMOD is designated by the guideline as a preferred air quality model for assessing potential impacts at receptors within 50 kilometers of a proposed source. AERMOD is capable of evaluating point, volume, and area sources, including stack and fugitive emissions, in both simple and complex terrain settings by calculating pollutant concentrations for all applicable regulatory averaging periods. Considering the expected emission sources associated with the project and the site topography and location, AERMOD is an appropriate model for the required assessment of the proposed project's ambient impacts. CTDEP's Ambient Impact Analysis Guideline (AIAG, July 1989) relies on the ISCST3 model for refined analyses that should now be conducted using AERMOD. CTDEP intends to update the AIAG to be consistent with the latest EPA guidance, but has not yet done so. Therefore, these modeling analyses follow the intent of the AIAG, but update its approach by substituting AERMOD for ISCST3.

Modeling was used to determine if the maximum predicted concentrations attributable to the proposed project exceeded the modeling Significant Impact Levels (SILs) shown in Table 1-4. If the SILs are exceeded for a pollutant, multi-source refined modeling is used to demonstrate that CAAQS/NAAQS and allowable PSD Class II increments are not violated. If predicted impacts are less than the SILs, the project cannot significantly contribute to any contravention of the CAAQS/NAAQS or the PSD increments and no further modeling analyses are needed to demonstrate compliance with applicable regulations and guidance.

Table 1-4:
Significance Levels for Air Quality Impacts

Pollutant	Significant Impact Levels for Averaging Times				
	Annual ($\mu g/m^3$)	24-Hour ($\mu g/m^3$)	8-Hour ($\mu g/m^3$)	3-Hour ($\mu g/m^3$)	1-Hour ($\mu g/m^3$)
Sulfur Dioxide (SO_2)	1	5		25	
Nitrogen Dioxide (NO_2)	1				
Particulate Matter $\leq$10 µm (PM_{10})	1	5			
Particulate Matter $\leq$2.5 µm ($PM_{2.5}$)	0.3	2.0			
Carbon Monoxide (CO)			500		2,000

2.0 PROJECT DESCRIPTION

The project will include two combustion turbines fired exclusively with natural gas. KCC is proposing that the turbines will have a nominal rating of approximately 14.3 MW each at ISO conditions. Combustion Turbine #1 (CT#1) will be designed to operate as a combined-cycle unit that can also utilize a natural gas-fired supplemental burner with a heat recovery boiler and a steam turbine to generate electricity. Combustion Turbine #2 (CT#2) will be designed to operate as a simple-cycle unit to generate electricity. As part of the project, KCC is proposing to replace four existing Tissue Machine Hood burners with low NO_x, natural gas-fired burners with maximum heat input ratings of 15 MMBtu/hr each, decommission two existing boilers and take credit for emission reductions attributable to the removal of seven diaper lines.

The project will not be a major modification because the net emissions increase will be less than the levels of significance as defined by the regulations (see Table 1-1). KCC will be eliminating and modifying emission sources to use for the netting of emissions. KCC will be decommissioning natural gas and No. 2 fuel oil-fired Boiler #1 and No. 2 fuel oil-fired Boiler #2. Recently KCC has removed seven diaper lines that emitted PM and VOC. Also, KCC is proposing to replace the four existing burners in the Tissue Machine Hoods with natural gas-fired low NO_x burners.

The NO_x emissions from both turbines will be controlled by utilizing dry low NO_x combustion technology. In addition, NO_x emissions from CT#1 and the supplemental firing will be controlled by selective catalytic reduction (SCR) and an oxidation catalyst will control the CO and VOC emissions. The CO and VOC emissions from CT#2 will be controlled by an oxidation catalyst.

Attachment E-2

3.0 MODELING METHOD

This section discusses the modeling approach used to perform the necessary ambient air quality impact analyses.

CTDEP requires atmospheric dispersion modeling analyses to demonstrate compliance with the CAAQS/NAAQS and PSD increments in accordance with the air quality regulations and guidance. Recent CTDEP policy has expanded this dispersion modeling to include $PM_{2.5}$. For pollutants that have emission rates that exceed 5 tpy (3 tpy for SO_2, PM_{10} and now $PM_{2.5}$), but are less than the values presented in Table 3-1, a stack height analysis may be used. If the stack meets the height criteria specified in CTDEP's Stationary Source Stack Height Guideline (SSSHG, revised April 1996), no further analyses are necessary. An Addendum to the SSSHG (dated January 1991) is applicable to all NO_2 and CO sources whose emissions exceed 5 tpy (but are less than 40 and 100 tpy, respectively). The SSSHG and its Addendum contain procedures that involve the use of ISCST3 for screening modeling. Those provisions remain in effect, since a planned screening modeling version of AERMOD (AERSCREEN) is not yet available.

If the stack is not of sufficient height, refined dispersion modeling is required to demonstrate compliance. For pollutants that have an emission rate that exceeds the relevant value in Table 3-1, refined modeling is required in accordance with the AIAG regardless of the source's stack height. For the proposed project, emissions of PM_{10}, $PM_{2.5}$, SO_2, CO and NO_x were modeled using refined air quality dispersion modeling, regardless of whether the guidance would allow screening using the SSSHG or Addendum. If modeled concentrations produced by

**Table 3-1:
Threshold Emission Rates for
Dispersion Modeling Requirements in Connecticut**

Pollutant	Threshold Emission Rate (tpy)
Sulfur Dioxide (SO_2)	15
Nitrogen Dioxide (NO_2)	40
Particulate Matter $\leq$10 µm (PM_{10})	15
Particulate Matter $\leq$2.5 µm ($PM_{2.5}$)	15
Carbon Monoxide (CO)	100

the source(s) being permitted exceed the significance levels shown in Table 1-4, other nearby sources would also be included in the dispersion analysis. Further, any permitted source is subject to the calculation of Maximum Allowable Stack Concentrations (MASC) for hazardous air pollutants (RCSA Section 22a-174-29). Compliance with the MASC requirements was demonstrated in Attachment E of the air permit application.

3.1 Model Selection

The *Guideline on Air Quality Models* (40 CFR 51 Appendix W) states that AERMOD is a preferred air quality model for near-field applications (within 50 km) in areas with both simple and complex terrain. The *Guideline on Air Quality Models* characterizes the AERMOD model as follows:

> "AERMOD is a steady-state plume dispersion model for assessment of pollutant concentrations from a variety of sources. AERMOD simulates transport and dispersion from multiple point, area, or volume sources based on up-to-date characterization of the atmospheric boundary layer. Sources may be located in simple or complex terrain. AERMOD accounts for building wake effects (i.e., plume downwash) based on the PRIME building downwash algorithms. The model employs hourly sequential preprocessed meteorological data to estimate concentrations for averaging times from one hour to one year (also multiple years). AERMOD is designed to operate in concert with two pre-processor codes: · AERMET processes meteorological data for input to AERMOD, and AERMAP processes terrain elevation data and generates receptor information for input to AERMOD."

As noted, when used in conjunction with EPA's BPIPPRM algorithm, AERMOD incorporates aerodynamic downwash and cavity zone concentration calculations, eliminating the need for separate cavity zone calculations. After careful consideration of the terrain surrounding the proposed project site and the attributes of the AERMOD model, the latest version of the AERMOD (07026) model was used to model the project-related air emissions at all ambient air receptor locations. In addition, the Connecticut PTMTPA-CONN complex terrain model was used for above stack-top receptors. The AERMOD model was applied in its "regulatory default" mode as described in the subsequent sections. PTMTPA-CONN was applied following the guidance in the AIAG. For complex terrain locations, the predicted concentrations using AERMOD and PTMTPA-CONN were compared and the higher of the two estimated impacts at each receptor was used to determine compliance with the CAAQS/NAAQS and PSD increments in accordance with the air quality regulations and guidance.

3.2 Model Set-up

As recommended by the *Guideline on Air Quality Models*, AERMOD was run in its regulatory default mode (DFAULT keyword) to predict ambient air concentrations (CONC keyword) for all applicable regulatory averaging times (1-hour, 3-hour, 8-hour, 24-hour and annual). Selecting the DFAULT option invokes the use of terrain elevation data, stack tip downwash and sequential data checking. Building dimensions of structures that may influence the air flow in the vicinity of the emission sources associated with the project was considered in the modeling analyses as described below in the Good Engineering Practice Stack Height Analyses section.

PTMTPA-CONN was run as recommended in the AIAG. Model switches were set for zero-plane displacement, streamflow, exponential wind speed profile and buoyancy induced dispersion. Concentrations for the higher of 10° or 15° spreads were used to demonstrate compliance on a 24-hour average basis.

3.3 Good Engineering Practice (GEP) Stack Height Analyses

The U.S. EPA provides specific guidance for determining the Good Engineering Practice (GEP) stack height and for determining whether building downwash will occur in the *Guidance for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations* (EPA-450/4-80-023R). GEP is defined as "the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, and wakes that may be created by the source itself, nearby structures, or nearby terrain "obstacles".

The GEP definition is based on the observed phenomenon of atmospheric flow in the immediate vicinity of a structure. It identifies the minimum stack height at which significant adverse aerodynamics (downwash) are avoided. The U.S. EPA GEP stack height regulations specify that the GEP stack height is calculated in the following manner:

$$H_{GEP} = H_B + 1.5L$$

where:

H_B = the height of adjacent or nearby structures, and

L = the lesser dimension (height or projected width) of the adjacent or nearby structures.

The regulations also specify that the creditable stack height for modeling purposes is either the GEP stack height as calculated or a de-minimis height of 65 meters. The stacks of the existing and proposed project-related sources will be affected by new or existing structures, therefore direction-specific building downwash parameters were included in the analyses for those point sources, as determined by using the U.S. EPA-approved Building Profile Input Program for PRIME (BPIPPRM, Version 04274).

3.4 Receptor Array

Predicted impacts were assessed at specific receptor points representative of the facility fence line and the ambient air. The modeling was conducted using a nested Cartesian grid. The initial grid extended to 10 km from the centroid of the combustion turbine stacks in all directions. Initial receptor spacing of 100 m from the centroid to 3 km, 500 m to 5 km, and 1000 m to 10 km was used. In addition, receptors were placed every 50 m along the fence line for a total of 4,354 receptors. Terrain elevations for receptors were taken from the U.S. Geological Survey's Digital Elevation Model (DEM). The receptor grid was prepared using AERMAP, the receptor and terrain pre-processor for AERMOD. The receptor array for the Class II area analyses is presented in Figures 3-1 and 3-2. Figure 3-1 shows the initial near-field array and Figure 3-2 depicts the initial far-field array.

3.5 Meteorological Input Data

The AERMOD model requires observations of representative meteorological variables to calculate ambient concentrations of emissions from the proposed project. These data include both near surface and upper air meteorological observations. For this project, 1987-1991 surface data from the Bradley Airport in Windsor Locks, CT (41°56'10"N, 72°40'55"W) National Weather Service (NWS) station, along with upper air data from the Albany International Airport (Albany, NY) NWS station were used as the meteorological input. The project site is approximately forty-three miles southwest of Bradley Airport and the airport meteorological observations will be climatologically representative of meteorological conditions at the project site. Because of the distance from the project site to the surface meteorological station and because of possible terrain steering due to the Housatonic River valley, both AERMOD and PTMTPA-CONN were used for this project. The upper air data from the Albany International

Figure 3-1:

Near-Field Receptor Array

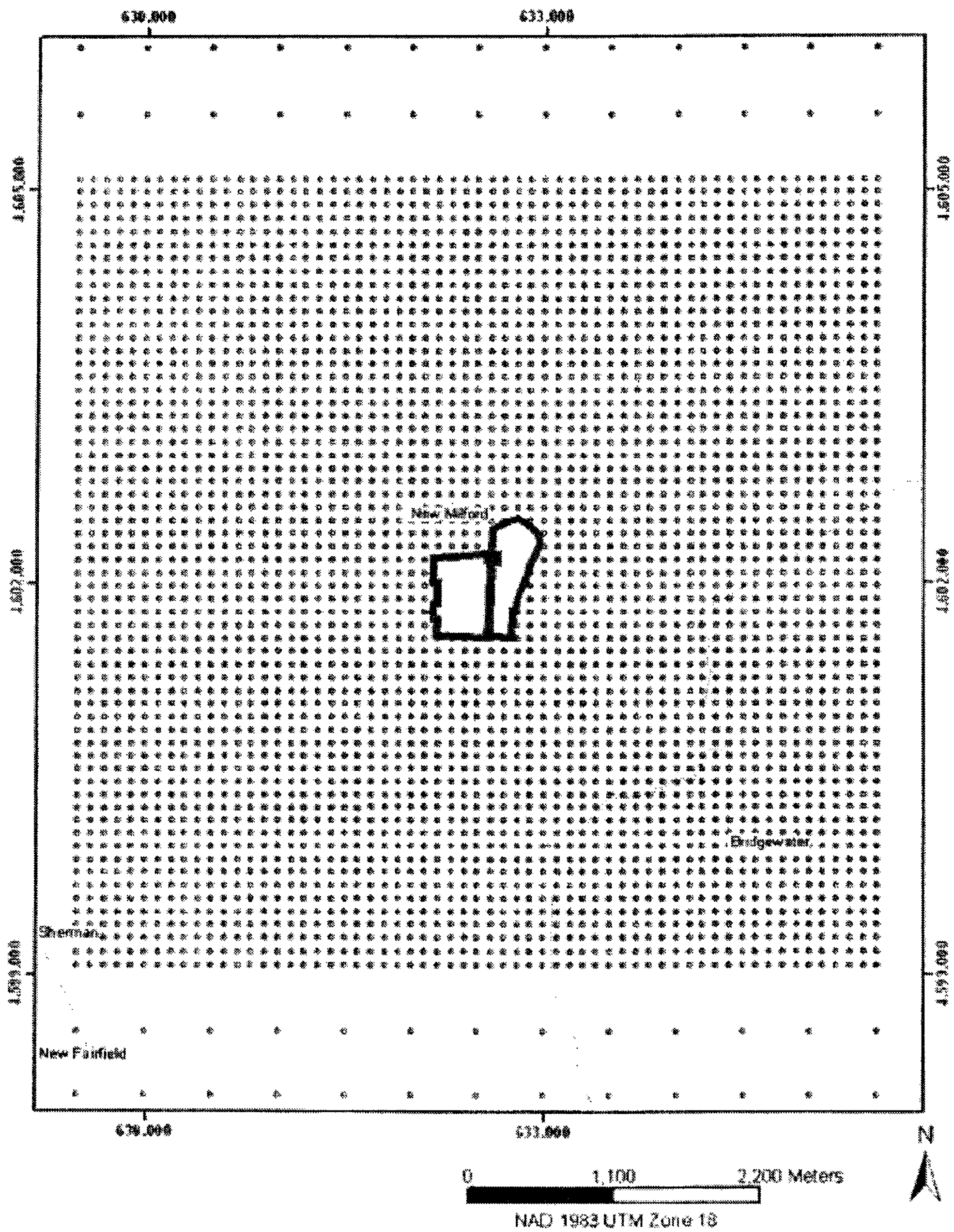
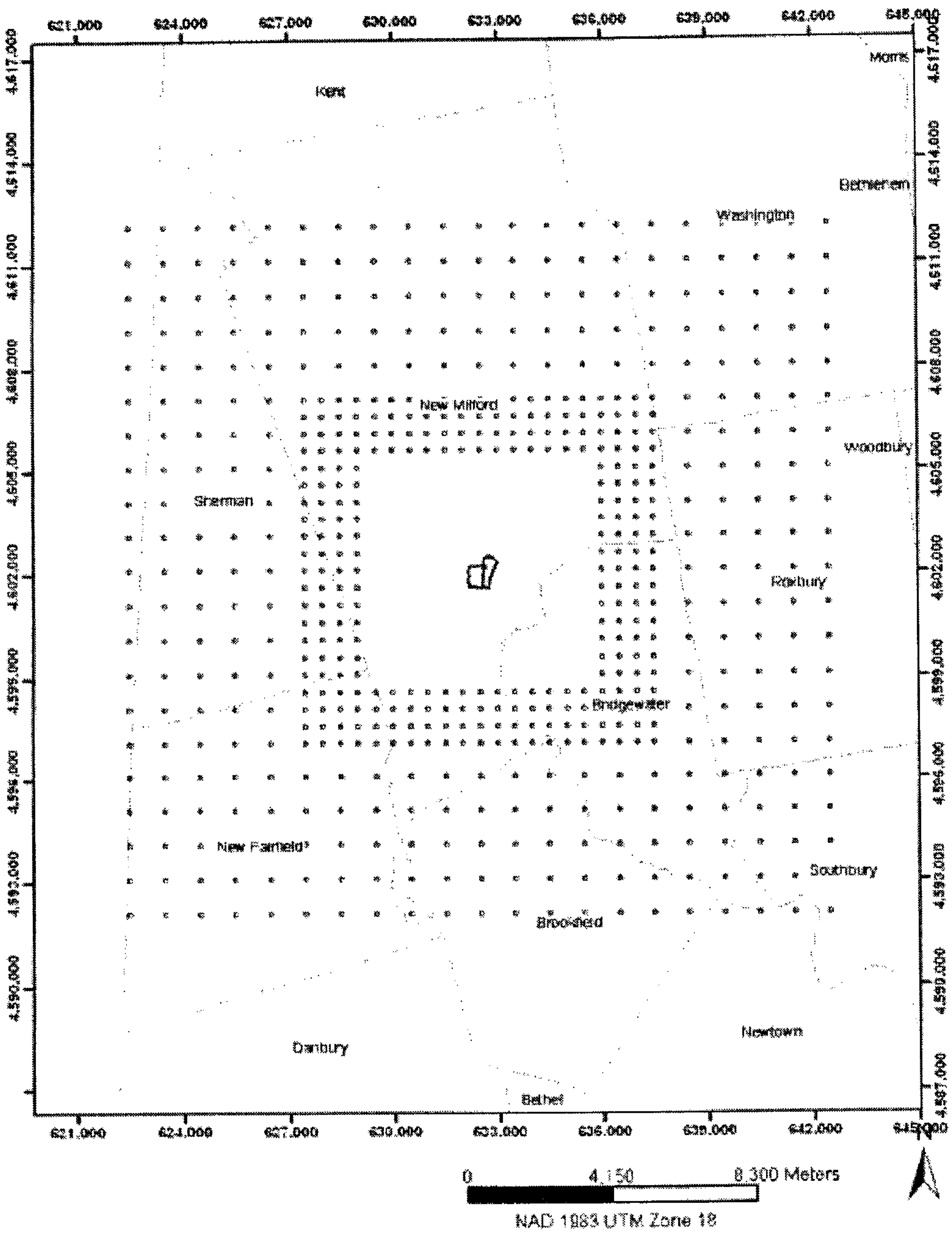


Figure 3-2:
Far-Field Receptor Array



Airport site are regionally representative of the proposed site. The meteorological data were reformatted to be compatible with AERMOD's meteorological preprocessor program, AERMET.

Following the recommendations of the "AERMOD Implementation Guide" (EPA, September 27, 2005), the micrometeorological representativeness of the Bradley airport site was determined by reviewing site-specific micrometeorological parameters including the surface roughness, Bowen ratio, and noontime albedo. The United States Geological Survey (USGS) Land Cover Dataset was downloaded from the Seamless Data Distribution System (http://seamless.usgs.gov/) for both the Bradley airport and the project site areas. As recommended by the Implementation Guide, 3 kilometer radius circles, divided into twelve 30 degree segments centered on each site, were considered for comparing the micrometeorological parameters between the two locations. The land cover data for both the project site and the Bradley airport are presented in Figures 3-3 and 3-4.

The surface area weighted average micrometeorological parameters in each sector were calculated based on the method presented in the *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)* (EPA-454/B-03-002, November 2004). Table 3-2 shows the correspondence between the Land Use Dataset classifications and AERMET's land use classifications as applied for this project. In order to classify meteorological seasons, temperature and snow cover data from Bradley for the modeling period (1987-1991) were analyzed. Following the definitions in the User's Guide, each month was classified by season as shown in Table 3-3. The User's Guide recommends:

- spring season defined as "1-2 months after the last killing frost" (occurrence of 28° F).
- summer season defined as "vegetation is lush"
- autumn season defined as "freezing conditions are common, deciduous trees are leafless, soils are bare after harvest, grasses are brown and no snow is present"
- winter season defined as "snow-covered surfaces and subfreezing temperatures," therefore the snow cover data for the airport were reviewed and all months with more than 50 percent of the days reporting a trace or more of snow cover were classified as winter.

Figure 3-3:
Land Cover for the Kimberly-Clark New Milford Site

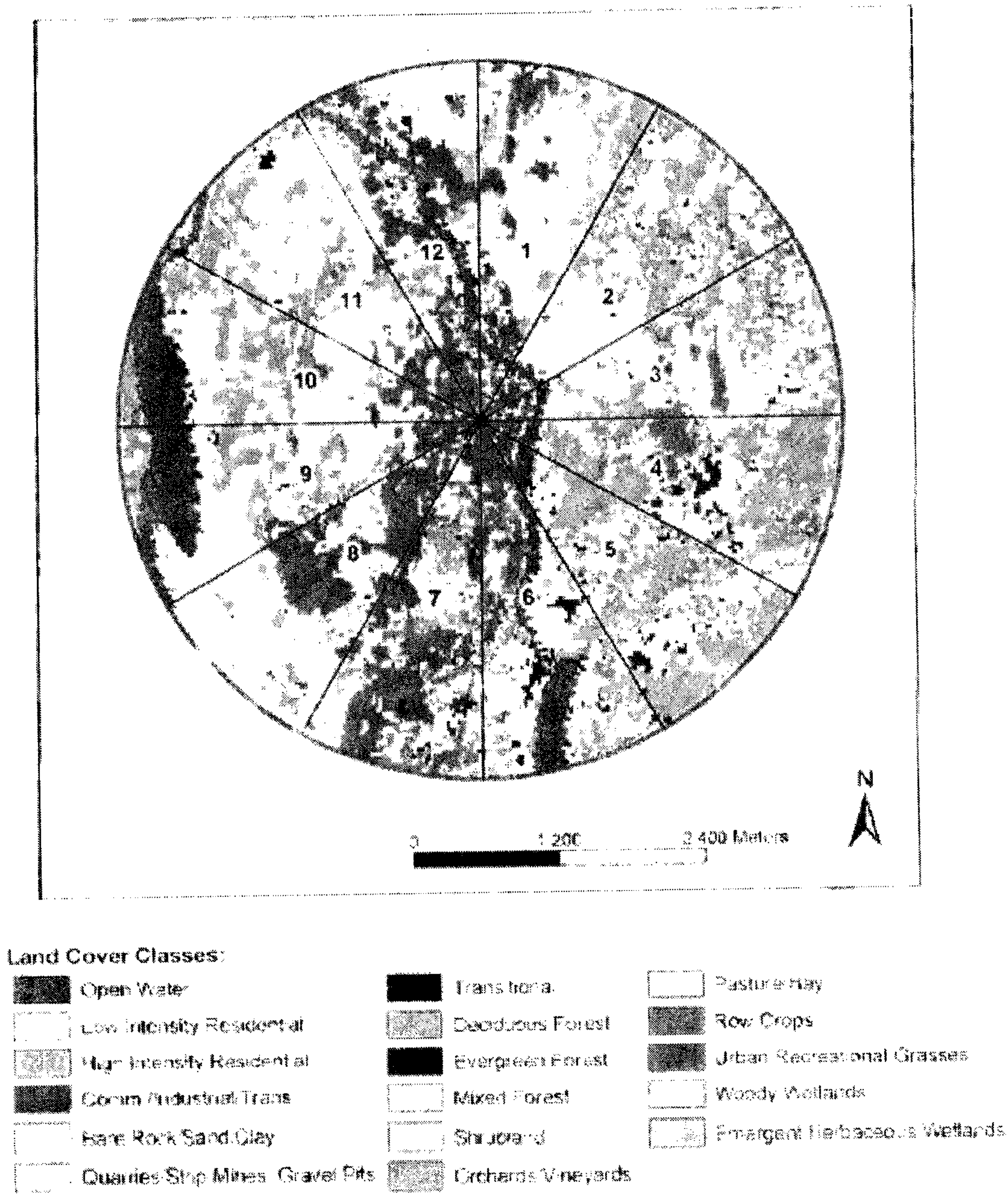
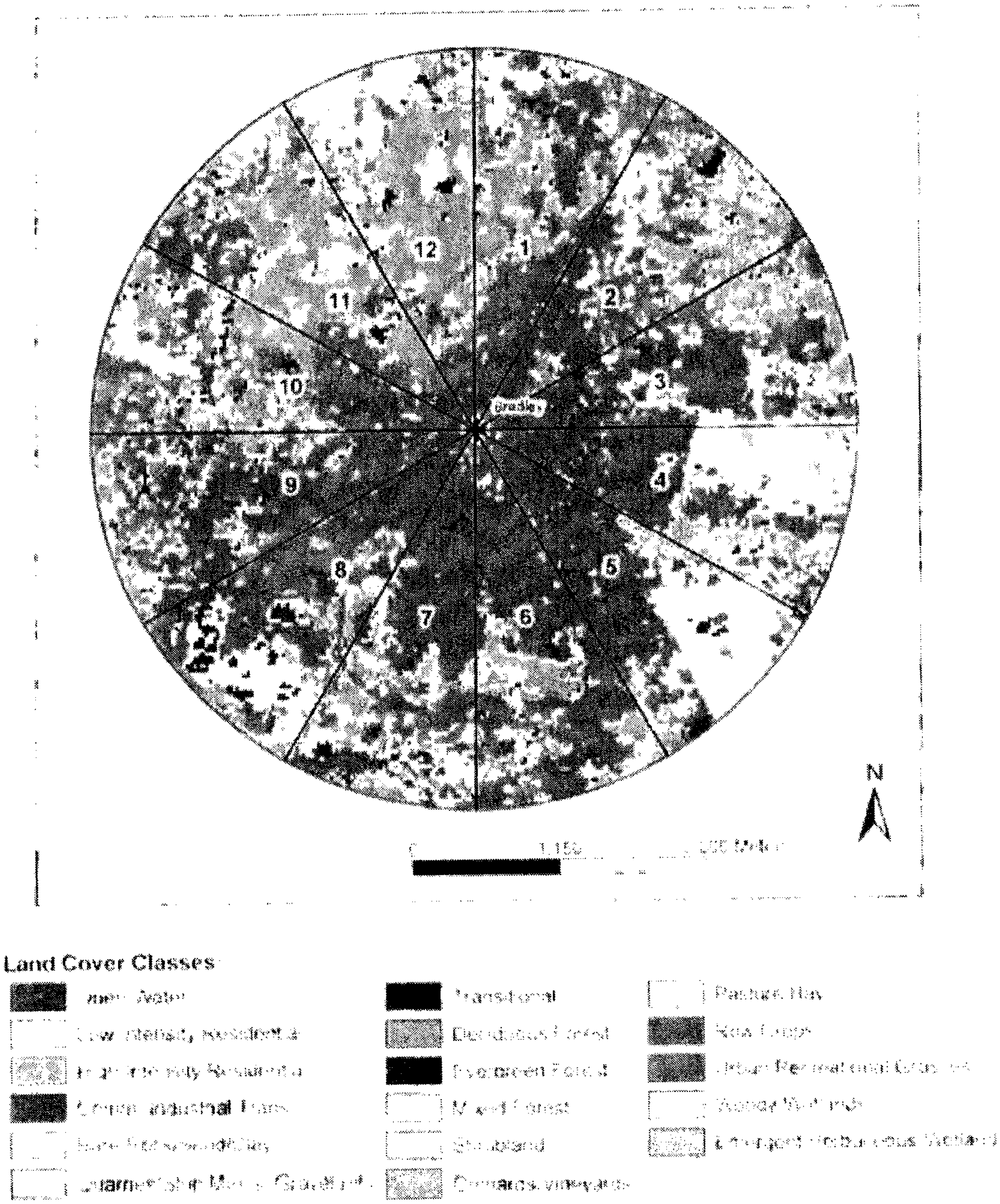


Figure 3-4:
Land Cover for the Bradley Airport



As specified by the Implementation Guide for rural sources using rural National Weather Service meteorological data, regional Bowen ratios and albedos were compared using the entire areas within the 3 kilometer circles. The calculated average values for the Bradley airport and project sites are summarized in Table 3-4. Note that both the albedos and the Bowen ratios for the airport and the project site are in good agreement.

Table 3-2:
Correspondence of Land Cover Dataset to AERMET Land Uses

Land Cover Dataset	AERMET
Open Water	Water
Deciduous Forest + ½ Mixed Forest	Deciduous Forest
Evergreen Forest + ½ Mixed Forest	Coniferous Forest
Emergent Herbaceous Wetlands	Swamp
Pasture/Hay	Grassland
Row Crops	Cultivated Land
Low and High Density Residential + Commercial, Industrial, Transportation	Urban
Transitional (barren)	Desert Shrubland

Table 3-3:
Seasonal Determination for Bradley Airport 1987-1991

Month	1987	1988	1989	1990	1991
Jan	Winter	Winter	Autumn	Winter	Winter
Feb	Winter	Winter	Autumn	Autumn	Autumn
Mar	Autumn	Autumn	Autumn	Autumn	Autumn
Apr	Spring	Spring	Autumn	Spring	Spring
May	Spring	Spring	Spring	Spring	Spring
Jun	Summer	Summer	Spring	Summer	Summer
Jul	Summer	Summer	Summer	Summer	Summer
Aug	Summer	Summer	Summer	Summer	Summer
Sep	Summer	Summer	Summer	Summer	Summer
Oct	Summer	Summer	Summer	Summer	Summer
Nov	Autumn	Autumn	Autumn	Autumn	Autumn
Dec	Autumn	Autumn	Winter	Autumn	Autumn

Table 3-4:
Comparison of Calculated Albedos and Bowen Ratios for the Bradley Airport and the Project Site

Site	Albedo	Bowen Ratio
Bradley airport	0.191	1.165
Project site	0.180	1.094

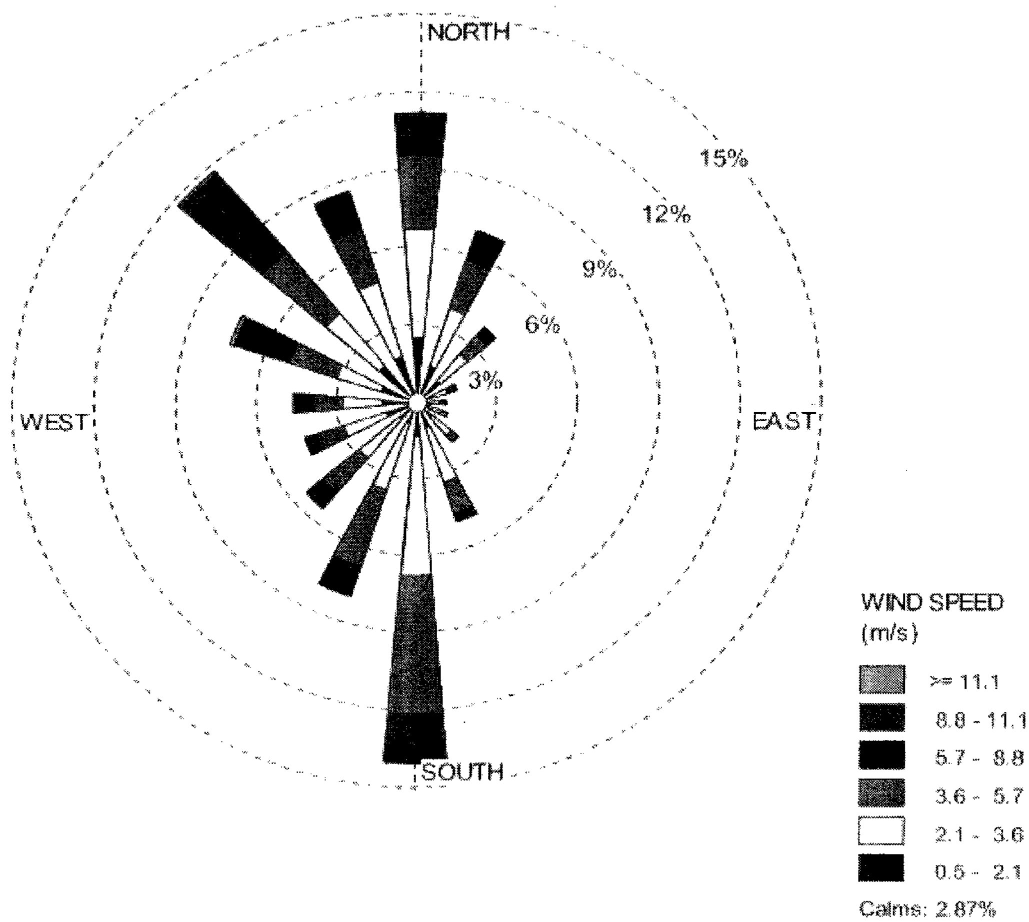
As recommended in the Implementation Guide, regional values for the albedo and Bowen ratio are used. For this modeling application, the airport values given above are selected as being regionally representative of the surface energy balance.

Table 3-5 presents the calculated surface roughness at the Project site and the Bradley airport for each 30 degree sector. Note that the roughness lengths are similar between the two sites. As recommended by the Implementation Guide surface roughness values from the airport will be used. Figure 3-5 presents a windrose for the Bradley airport based on the hourly data.

Table 3-5:
Comparison of Calculated Surface Roughness for the Bradley Airport and the Project Site

Sector Degrees	Airport Roughness (m)	Project Site Roughness (m)
0-30	0.50	0.86
30-60	0.50	0.68
60-90	0.79	0.71
90-120	0.92	0.78
120-150	0.88	0.80
150-180	0.79	0.62
180-210	0.76	0.70
210-240	0.69	0.85
240-270	0.58	0.72
270-300	0.54	0.73
300-330	0.60	0.90
330-360	0.62	0.72
All Sectors Avg:	0.68	0.76

Figure 3-5: Bradley Airport Windrose (1987-1991)



3.6 Source Inventory and Emissions Data

Table 3-6 presents the existing emissions inventory for the New Milford Mill. The fourth column indicates whether or not the source will operate following implementation of the project. Note that Boilers # 1 and 2, the existing burners for TM Hoods # 1 and 2 and the seven diaper machines will be or have been eliminated. Emissions for the units that will not operate following implementation of the project have been modeled as "negative emissions" when considering the net air quality impact of the project. The emergency equipment (fire pumps and emergency generators) were not modeled since those units only operate in the event of an emergency, or for about a ½ hour once a week for testing purposes. The other listed sources that will remain in operation were not considered further in the modeling analyses since they are not part of the project.

Table 3-7 shows the stack parameters for the new sources and stacks to be added as part of the project. At this time a manufacturer for the turbines has not been selected but KCC has developed design specification requirements. The NO_x and CO emission estimates from the turbines are part of the design specification and all other turbine emission estimates are based on EPA emission factors published in AP-42. Each turbine is expected to have a maximum heat input of approximately 175 MMBtu/hr assuming that natural gas has a higher heating value of 1,020 Btus/ft^3. KCC is proposing that the maximum emission concentrations produced by the turbines (prior to add-on controls) will be as follows: NO_x – 15 ppmvd and CO – 25 ppmvd. It is assumed that the CT#1 NO_x emissions will be controlled to 2.5 ppmvd. It is assumed that the CT#1 and CT#2 CO emissions will be controlled by 90%.

There will be a total of 5 new stacks associated with the new emission sources. Table 3-7 depicts three anticipated operating scenarios for the project. Under each operating scenario, the specified stacks will be in-use. For example, under Scenario 1, Stacks # 1 and 2 will be in use.

Table 3-6: Existing Air Emissions Inventory for the Kimberly Clark New Milford Mill

Source	Title V EU#	Historical Source?	Will Source Exist After Project?	2005 Emissions Rate: PM10 Rate (g/sec)	2005 Emissions Rate: PM2.5 Rate (g/sec)	2005 Emissions Rate: NOx Rate (g/sec)	2005 Emissions Rate: SOx Rate (g/sec)	2005 Emissions Rate: CO Rate (g/sec)	Separate Stack?	Stack Height (feet)	Stack Exit Diameter (feet)	Min Exit Temp (F)	Min Flow @ MRC (acfm)
Boiler #1	EU 1	Yes	No	0.17	0.16	1.24	3.27	0.90	no	103	5.3	450	19,000
Boiler #2	EU 2	Yes	No	0.12	0.11	1.01	2.29	0.26	no				
				0.30	0.27	2.25	5.55	1.16					
Boiler #3	EU 3	Yes	Yes	0.16	0.15	1.89E+00	3.02E+00	8.36E-01	yes	73	3.5	400	10,000
TM Hood #1 (burners)	EU 4a	Yes	No**	1.89E-02	1.89E-02	4.01E-01	2.27E-03	1.32E-01	yes	77	3.3	550	22,050
TM Hood #2 (burners)	EU 5a	Yes	No**	2.52E-02	2.52E-02	7.06E-01	3.02E-03	1.76E-01	yes	66.75	46.375" x 58.375"	600	53,000
TM Hood Process				1.25E-01	1.25E-01	na	na	na					
	Hood 1, EU 4b(Drum Filter)	Yes	Yes	5.04E-02	5.04E-02				2 each	59.75	5.6	95.4	96,000
	Hood 1, EU 4b(Scrubber)	Yes	Yes	1.22E-02	1.22E-02				Yes	35.5	5.0	81.9	53,000
	Hood 2, EU 5b(Drum Filter)	Yes	Yes	5.04E-02	5.04E-02				2 each	59.75	5.6	95.4	96000
	Hood 2, EU 5b(Scrubber)	Yes	Yes	1.22E-02	1.22E-02				Yes	35.5	5.0	81.9	53000
Diaper Machine #1	EU 6	Yes	No	0.033	0.033	na	na	na	Yes	52	1.6	86	7,000
Diaper Machine #2	EU 7	Yes	No	0.033	0.033	na	na	na	Yes	52	1.6	86	3,900
Diaper Machine #3	EU 8	Yes	No	0.033	0.033	na	na	na	Yes	52	1.6	86	3,900
Diaper Machine #4	EU 9	Yes	No	0.033	0.033	na	na	na	Yes	52	1.6	86	3,900
Diaper Machine #5	EU10	Yes	No	0.033	0.033	na	na	na	Yes	52	1.6	86	7,000
Diaper Machine #6	EU11	Yes	No	0.033	0.033	na	na	na	Yes	52	1.6	86	7,000
Diaper Machine #7	EU 12	Yes	No	0.033	0.033	na	na	na	Yes	52	1.8	86	7,000
Off Line Tissue 2 Winders	EU 16	Yes	Yes	9.07E-02	9.07E-02	na	na	na	Yes	31	2.0	86	42,500
Boiler Fire Water*	EU 39	Yes	Yes	1.39E-03	1.39E-03	1.83E-02	1.10E-04	1.53E-02	Yes	12	0.833	350	292
Mark I Multifolder	EU 13	Yes	Yes	6.50E-04	6.50E-04	,na	na	na	Yes	52	2	86	2,500
Mark II Multifolder	EU 14	Yes	Yes	3.29E-04	3.29E-04	na	na	na			Both EU13&14 go to one stack		
Diesel Fire Pump, River	EU 31	Yes	Yes	6.42E-02	6.42E-02	9.13E-01	3.14E-04	1.97E-01	Yes	8	0.416	1008	1,234
Diesel Fire Pump, South	EU 32	Yes	Yes	6.96E-02	6.96E-02	9.90E-01	6.80E-02	2.13E-01	Yes	9	0.416	1092	1,337
Diesel Fire Pump, North	EU 38	Yes	Yes	6.96E-02	6.96E-02	9.90E-01	3.40E-04	2.13E-01	Yes	6	0.416	1092	1,337
Emergency Generator #1	EU 33	Yes	Yes	1.73E-02	1.73E-02	2.47E-01	1.69E-02	5.31E-02	Yes	25	0.333	1044	333
Emergency Generator #2	EU 34	Yes	Yes	1.73E-02	1.73E-02	2.47E-01	1.69E-02	5.31E-02	Yes	20	0.208	1044	333
Emergency Generator, Water	EU 40	Yes	Yes	5.57E-03	5.57E-03	7.92E-02	5.44E-03	1.71E-02	Yes	6	0.125	716	114

* Exhaust flow rate is based on a CB Model 4 1500 (1.5 MMBtu/hr) and temperature is estimated.
** The TM Hood burners will be replaced during the proposed project, they will have new stacks.

Table 3-7: Operating Scenarios and Stack Parameters for the Combined Heat and Power Project

Emission Units -

U1a & U1b (Combustion Turbine #1 w/Supplemental Firing)
U2a (Combustion Turbine #2)
U2b (Tissue Machine #1 Hood Burners)
U2c (Tissue Machine #2 Hood Burners)

Scenario	Stack #	Emission Rates PM10 (g/s)	PM2.5 (g/s)	SO2 (g/s)	CO (g/s)	NOx (g/s)	Temp (F)	Temp (K)	Stack Height (feet)	Stack Diameter (inches)	Exhaust Flow (ACFM)	Exhaust Velocity (m/s)
Scenario #1												
	Stack #1	2.22E-01	2.22E-01	3.27E-02	1.50E-01	2.55E-01	325	436	78	72	118,257	21.2
	Stack #2	1.88E-01	1.88E-01	3.13E-02	1.23E+00	1.37E+00	425	491	78	90	177,009	20.4
Scenario #2												
	Stack #1	2.22E-01	2.22E-01	3.27E-02	1.50E-01	2.55E-01	325	436	78	72	118,257	21.2
	Stack #3	3.02E-02	3.02E-02	2.22E-03	5.52E-01	7.56E-02	600	589	85	60	50,000	12.94
	Stack #4	3.02E-02	3.02E-02	2.22E-03	5.52E-01	7.56E-02	600	589	85	60	50,000	12.94
Scenario #3												
	Stack #1	2.22E-01	2.22E-01	3.27E-02	1.50E-01	2.55E-01	325	436	78	72	118,257	21.2
	Stack #3	6.72E-02	6.72E-02	9.13E-03	5.82E-01	3.71E-01	600	589	85	60	58,478	15.1
	Stack #4	6.72E-02	6.72E-02	9.13E-03	5.82E-01	3.71E-01	600	589	85	60	58,478	15.1
	Stack #5	4.45E-02	4.45E-02	7.46E-03	3.00E-02	2.95E-01	950	783	85	60	51,694	13.4

4.0 MODELING RESULTS

The significant impact levels (SILs) specified in Table 3a(i)-1 in Section 22a-174-3a(i)(1) of the RCSA and DEP's draft "Interim PM2.5 New Source Review Modeling Policy and Procedures" (June 2007) are de-minimis concentrations below which the project's impacts are considered to be insignificant. These pollutant and averaging period specific concentrations were used to determine the spatial extent of the significant impact areas. Concentrations for all the regulatory averaging periods are produced as standard output from AERMOD. PTMTPA-CONN produces concentration results for 1-, 3- and 24-hour averaging periods. The 8-hour averaging period concentrations were predicted for PTMTPA-CONN by adjusting the 1-hour predicted concentrations using the EPA's recommended screening modeling adjustment factor of 0.7 (Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised, EPA-454/R-92-019). Annual concentrations from PTMTPA-CONN were calculated by multiplying the highest 24-hour impact by the largest ratio of the annual to second-highest 24-hour impacts from AERMOD for the same receptor and pollutant similar to the recommendation in the AIAG. In a similar manner, the $PM_{2.5}$ highest-eighth-high 24-hour impacts were calculated by multiplying the highest 24-hour impacts by the largest ratio of the highest-eighth-high to the highest-second-high 24-hour impacts from AERMOD for the same receptor. Based upon the emission scenarios described in Section 3.6, if predicted maximum impacts for a specific pollutant and averaging period are below their respective SIL concentrations, it is concluded that the impacts are insignificant and no further analyses are necessary.

The results of the refined single-source modeling analyses are summarized in Tables 4-1 through 4-5 for SO_2, NO_2, PM_{10}, $PM_{2.5}$, and CO, respectively. The modeling results show that the net impacts of the project sources were insignificant for all pollutants. Therefore, the project does not significantly contribute to any exceedance of the CAAQS/NAAQS or PSD increments and no further multi-source modeling analyses are required.

Table 4-1: Maximum Predicted Single-Source Sulfur Dioxide Impacts

Source Group	Year	Annual Average – Maximum Impact: UTM Coordinates Easting (meters)	Annual: UTM Coordinates Northing (meters)	Annual: Elevation (meters)	Annual: Concentration (µg/m³)	Annual: Case No.*	Annual: Distance to Insignificance (meters)	24-Hour Average – Highest Second High Impact: UTM Coordinates Easting (meters)	24-Hour: UTM Coordinates Northing (meters)	24-Hour: Elevation (meters)	24-Hour: Concentration (µg/m³)	24-Hour: Case No.*	24-Hour: Distance to Insignificance (meters)	3-Hour Average – Highest Second High Impact: UTM Coordinates Easting (meters)	3-Hour: UTM Coordinates Northing (meters)	3-Hour: Elevation (meters)	3-Hour: Concentration (µg/m³)	3-Hour: Case No.*	3-Hour: Distance to Insignificance (meters)
1 Net Project Changes	1987	622,461	4,605,849	331	-4.47E-03	1	N/A	632,551	4,601,857	74	2.06E-02	3	N/A	634,561	4,601,149	184	0.198	1	N/A
	1988	622,461	4,602,849	369	-3.88E-03	1	N/A	632,551	4,601,857	74	1.42E-02	3	N/A	634,361	4,601,949	181	0.230	1	N/A
	1989	622,461	4,603,849	357	-4.38E-03	1	N/A	632,553	4,601,907	73	3.15E-02	3	N/A	633,561	4,602,249	178	0.160	1	N/A
	1990	622,461	4,600,849	376	-3.95E-03	1	N/A	632,553	4,601,907	73	2.65E-02	3	N/A	634,461	4,601,649	189	0.209	1	N/A
	1991	622,461	4,600,849	376	-3.60E-03	1	N/A	632,553	4,601,907	73	3.05E-02	3	N/A	634,361	4,601,949	181	0.240	1	N/A
PTMTPA-CONN		622,461	4,591,849	183	≤0	1	N/A	622,461	4,591,849	183	≤0	1	N/A	632,061	4,601,849	87	-0.140	1	N/A
2 New Sources	1987	632,550	4,601,663	72	2.41E-02	3	N/A	632,550	4,601,663	72	2.09E-01	3	N/A	633,361	4,601,449	154	0.536	1	N/A
	1988	632,461	4,602,249	76	2.62E-02	3	N/A	632,544	4,601,707	73	1.97E-01	3	N/A	633,261	4,601,849	135	0.365	1	N/A
	1989	632,550	4,601,663	72	2.38E-02	3	N/A	632,550	4,601,663	72	2.20E-01	3	N/A	633,361	4,602,049	150	0.485	1	N/A
	1990	632,461	4,602,149	75	3.00E-02	3	N/A	632,552	4,601,713	73	2.29E-01	3	N/A	633,861	4,601,649	157	0.560	1	N/A
	1991	632,550	4,601,663	72	2.46E-02	3	N/A	632,538	4,601,558	72	2.23E-01	1	N/A	633,861	4,601,649	157	0.622	1	N/A
PTMTPA-CONN		633,261	4,601,449	148	0.106	3	N/A	633,361	4,601,749	158	0.570	1	N/A	633,261	4,601,549	148	3.06	1	N/A
Maximum Group 1					≤0						3.15E-02						0.240		
Significance Level					1						5						25		
PSD Increment					20						91						512		
Maximum Group 2					0.106						0.570						3.06		
Significance Level					1						5						25		
CAAQS/NAAQS					80						365						1,300		

* Operating scenario case number

Table 4-2: Maximum Predicted Single-Source Nitrogen Dioxide Impacts

Source Group	Year	Annual Average Maximum Impact UTM Coordinates Easting (meters)	Northing (meters)	Elevation (meters)	Concentration (µg/m³)	Case No.*	Distance to Insignificance (meters)
1 Net Project Changes	1987	622,461	4,605,849	331	-1.58E-03	1	N/A
	1988	622,461	4,602,849	369	-1.41E-03	1	N/A
	1989	622,461	4,603,849	357	-1.57E-03	1	N/A
	1990	622,461	4,602,849	369	-1.40E-03	1	N/A
	1991	622,461	4,600,849	376	-1.26E-03	1	N/A
PTMTPA-CONN		622,461	4,591,849	183	≤0	1	N/A
2 New Sources	1987	632,550	4,601,663	72	0.673	3	N/A
	1988	632,550	4,601,663	72	0.714	3	N/A
	1989	632,550	4,601,663	72	0.662	3	N/A
	1990	632,461	4,602,149	75	0.730	3	N/A
	1991	632,550	4,601,663	72	0.675	3	N/A
PTMTPA-CONN		633,361	4,601,349	151	1.75	3	2,594
Maximum Group 1					≤0		
Significance Level					1		
PSD Increment					25		
Maximum Group 2					1.75		
Significance Level					1		
CAAQS/NAAQS					100		

* Operating scenario case number

Table 4-3: Maximum Predicted Single-Source PM_{10} Impacts

Source Group	Year	Annual Average Maximum Impact: UTM Coordinates Easting (meters)	Annual: UTM Coordinates Northing (meters)	Annual: Elevation (meters)	Annual: Concentration ($\mu g/m^3$)	Annual: Case No.*	Annual: Insignificance Distance (meters)	24-Hour Average Highest Second High Impact: UTM Coordinates Easting (meters)	24-Hour: UTM Coordinates Northing (meters)	24-Hour: Elevation (meters)	24-Hour: Concentration ($\mu g/m^3$)	24-Hour: Case No.*	24-Hour: Insignificance Distance (meters)
1	1987	634,661	4,600,949	175	2.20E-04	1	N/A	633,561	4,601,649	161	0.406	1	N/A
Net Project Changes	1988	634,361	4,601,849	174	1.45E-03	1	N/A	633,361	4,601,849	157	0.493	1	N/A
	1989	622,461	4,603,849	357	-1.90E-04	3	N/A	633,461	4,601,549	163	0.387	1	N/A
	1990	622,461	4,602,849	369	-1.60E-04	3	N/A	633,861	4,601,449	154	0.409	1	N/A
	1991	634,461	4,601,449	174	3.43E-03	1	N/A	633,361	4,601,649	164	0.372	1	N/A
PTMTPA-CONN		622,461	4,591,849	183	≤0	1	N/A	633,361	4,602,449	148	0.310	1	N/A
2	1987	632,550	4,601,663	72	0.162	3	N/A	632,550	4,601,663	72	1.39	3	N/A
New Sources	1988	632,461	4,602,249	76	0.180	3	N/A	632,544	4,601,707	73	1.31	3	N/A
	1989	632,550	4,601,663	72	0.160	3	N/A	632,550	4,601,663	72	1.47	3	N/A
	1990	632,461	4,602,149	75	0.206	3	N/A	632,552	4,601,713	73	1.51	3	N/A
	1991	632,550	4,601,663	72	0.166	3	N/A	632,538	4,601,558	72	1.41	1	N/A
PTMTPA-CONN		633,261	4,601,449	148	0.732	3	N/A	633,261	4,601,449	148	3.72	3	N/A
Maximum Group 1					3.43E-03						0.493		
Significance Level					1						5		
PSD increment					17						30		
Maximum Group 2					0.732						3.72		
Significance Level					1						5		
CAAQS/NAAQS					50						150		

* Operating scenario case number

Table 4-4: Maximum Predicted Single-Source $PM_{2.5}$ Impacts

Source Group	Year	Annual Average – Maximum Impact – UTM Coordinates Easting (meters)	Northing (meters)	Elevation (meters)	Concentration (µg/m³)	Case No.*	Insignificance Distance (meters)	24-Hour Average – Highest Eighth High Impact – UTM Coordinates Easting (meters)	Northing (meters)	Elevation (meters)	Concentration (µg/m³)	Case No.*	Insignificance Distance (meters)
1	1987	634,661	4,600,949	175	1.22E-03	1	N/A	633,461	4,601,649	168	0.208	1	N/A
Net Project Changes	1988	634,361	4,601,849	174	2.32E-03	1	N/A	633,361	4,601,849	157	0.240	1	N/A
	1989	622,461	4,603,849	357	-1.70E-04	1	N/A	633,461	4,602,349	161	0.195	1	N/A
	1990	634,361	4,601,749	173	5.80E-04	1	N/A	633,361	4,601,549	162	0.180	1	N/A
	1991	634,461	4,601,349	173	4.36E-03	1	N/A	633,361	4,601,649	164	0.227	1	N/A
PTMTPA-CONN		634,261	4,601,949	169	6.49E-05	1	N/A	633,361	4,602,349	151	0.365	1	N/A
2	1987	632,550	4,601,663	72	0.162	3	N/A	632,550	4,601,663	72	0.988	3	N/A
New Sources	1988	632,461	4,602,249	76	0.180	3	N/A	632,550	4,601,663	72	0.973	3	N/A
	1989	632,550	4,601,663	72	0.160	3	N/A	632,550	4,601,663	72	0.971	3	N/A
	1990	632,461	4,602,149	75	0.206	3	N/A	632,550	4,601,663	72	1.03	3	N/A
	1991	632,550	4,601,663	72	0.166	3	N/A	632,552	4,601,713	73	0.887	3	N/A
PTMTPA-CONN		633,261	4,601,449	148	0.732	3	2,119	633,261	4,601,449	148	3.34	3	1,844
Maximum Group 1					4.36E-03						0.365		
Significance Level					0.3						2		
PSD Increment					N/A						N/A		
Maximum Group 2					0.732						3.34		
Significance Level					0.3						2		
CAAQS/NAAQS					15						35		

* Operating scenario case number

Table 4-5: Maximum Predicted Single-Source Carbon Monoxide Impacts

Source Group	Year	1-Hour Average Highest Second High Impact UTM Coordinates Easting (meters)	Northing (meters)	Elevation	Concentration (µg/m³)	Case No.*	Distance to Insignificance (meters)	8-Hour Average Highest Second High Impact UTM Coordinates Easting (meters)	Northing (meters)	Elevation	Concentration (µg/m³)	Case No.*	Distance to Insignificance (meters)
1	1987	633,361	4,601,849	157	24.8	1	N/A	633,261	4,601,849	135	4.80	3	N/A
Net Project Changes	1988	633,261	4,601,749	141	29.0	3	N/A	633,161	4,601,749	124	5.73	3	N/A
	1989	633,261	4,601,649	146	25.8	3	N/A	633,261	4,602,149	131	4.68	3	N/A
	1990	633,261	4,601,649	146	27.9	3	N/A	633,261	4,601,749	141	4.83	3	N/A
	1991	633,261	4,601,749	141	28.4	3	N/A	633,261	4,601,549	148	5.01	3	N/A
PTMTPA-CONN		633,161	4,600,149	143	2.68	3	N/A	633,161	4,600,149	143	1.87	3	N/A
2	1987	633,261	4,601,349	144	35.3	3	N/A	632,550	4,601,663	72	9.63	3	N/A
New Sources	1988	633,261	4,601,749	141	38.8	3	N/A	633,261	4,601,749	141	9.37	3	N/A
	1989	633,161	4,601,449	129	34.1	3	N/A	632,550	4,601,663	72	9.29	2	N/A
	1990	633,261	4,601,649	146	38.1	3	N/A	632,550	4,601,663	72	8.09	2	N/A
	1991	633,261	4,601,749	141	38.6	3	N/A	632,540	4,601,607	72	8.36	1	N/A
PTMTPA-CONN		633,161	4,600,349	144	66.4	3	N/A	633,161	4,600,349	144	46.4	3	N/A
Maximum Group 1					29.0						5.73		
Significance Level					2,000						500		
PSD Increment					N/A						N/A		
Maximum Group 2					66.4						46.4		
Significance Level					2,000						500		
CAAQS/NAAQS					40,000						10,000		

* Operating scenario case number

5.0 SUMMARY AND CONCLUSIONS

The operation of the proposed Project sources at the New Milford Mill Facility will have insignificant contributions to the CAAQS/NAAQS and PSD increment levels for SO_2, NO_2, PM_{10}, $PM_{2.5}$ and the CAAQS/NAAQS for CO. Thus, the dispersion modeling analyses performed by TRC have demonstrated compliance with all applicable ambient air quality standards, regulations and guidance in fulfillment of the requirements for issuing permits to construct and operate the combined heat and power project at the New Milford Mill Facility.

The input and output files used in conducting the analyses are included in the attached CD-ROM (Appendix A). The file naming conventions and other important information are described in an accompanying README document file.

Attachment E-3

DRAFT

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

NEW SOURCE REVIEW PERMIT TO CONSTRUCT AND OPERATE A STATIONARY SOURCE

Issued pursuant to Title 22a of the Connecticut General Statutes (CGS) and Section 22a-174-3a of the Regulations of Connecticut State Agencies (RCSA).

Owner/Operator:	Kimberly-Clark Corporation
Address:	58 Pickett District Road, New Milford, CT 06776
Equipment Location:	58 Pickett District Road, New Milford, CT 06776
Equipment Description:	Solar Titan 130 Combustion Turbine #1 with Eclipse 30FFB-SP Supplemental Burner

Town-Permit Numbers:	130-0070
Premises Number:	6
Permit Issue Date:	
Expiration Date:	

Gina McCarthy
Commissioner

Date

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

The conditions on all pages of this permit and attached appendices shall be verified at all times except those noted as design specifications. Design specifications need not be verified on a continuous basis; however, if requested by the commissioner, demonstration of compliance shall be shown.

PART I. OPERATIONAL CONDITIONS

A. Operating Limits

1. Fuel Type: Natural Gas
2. Maximum Fuel Consumption over any Consecutive 12 Month Period: 1502 MMcf(Turbine) and 215 MMcf (Supp. Burner)
3. Maximum Fuel Sulfur Content (% by weight, dry basis): <0.003

B. Design Specifications

1. Maximum Fuel Firing Rate(s)(cf/h): 171,412(Turbine) and 24,510 (Supp. Burner)
2. Maximum Gross Heat Input (MMBtu/hr): 174.84 (Turbine) and 25 (Supp. Burner)

C. Stack Parameters

1. Minimum Stack Height (ft): 78
2. Minimum Exhaust Gas Flow Rate (acfm): 81,808 (50% load, 100°F ambient)
3. Stack Exit Temperature (°F): 325
4. Minimum Distance from Stack to Property Line (ft): 308

PART II. CONTROL EQUIPMENT (Applicable if -X- Checked) (See Appendix E for Design Specifications)

A. Type

- ☐ None
- ☐ Scrubber
- ☐ Electrostatic Precipitator
- ☐ Cyclone
- ☐ Multi-Cyclone
- ☐ Thermal DeNOx
- ☐ Selective Non-Catalytic Reduction
- ☒ Selective Catalytic Reduction
- ☒ Low NOx Burner
- ☐ Fabric Filter
- ☐ Particulate Trap
- ☒ Other

B. Minimum Efficiency

1. Capture Efficiency (%): ____
2. Removal Efficiency (%): ____
3. Overall Efficiency (%): ____

FIRM NAME: Kimberly-Clark Corporation
EQUIPMENT LOCATION: 58 Pickett District Road, New Milford, CT 06776
EQUIPMENT DESCRIPTION: Solar Titan 130 Combustion Turbine #1 with Eclipse 30FFB-SP Supplemental Burner

Town No: 130 Premises No: 6 Permit No: 0070 Stack No: 35

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF AIR MANAGEMENT

PART III. CONTINUOUS EMISSION MONITORING REQUIREMENTS AND ASSOCIATED EMISSION LIMITS (Applicable if -X- Checked)

CEM shall be required for the following pollutant/operational parameters and enforced on the following basis:

Pollutant/Operational Parameter	Averaging Times	Emission Limit	Units
☐ None			
☐ Opacity	six minute block		
☐ SOx	3 hour rolling		
☒ NOx	24 hour rolling	2.5	ppmvd @ 15% O_2
☐ CO	1 hour block		
☐ CO_2	1 hour block		
☐ O_2	1 hour block		
☐ Temperature	continuous		

(See Appendix A for General Requirements)

PART IV. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS

A. Monitoring

1. The Permittee shall use a non-resettable totalizing fuel metering device to continuously monitor fuel feed to this permitted source.

2. The Permittee may elect not to monitor the total sulfur content of the natural gas, in accordance with 40 CFR §60.4365 Subpart KKKK, if the potential emissions do not exceed 0.060 lb SO_2/MMBtu. This demonstration may be made using the purchase contract specifying that the fuel sulfur content for the natural gas is less than or equal to 20 grains of sulfur/100 standard cubic feet and results in potential emissions not exceeding 0.060 lb SO_2/MMBtu. This determination shall be done on an annual basis pursuant to 40 CFR §60.4415 Subpart KKKK.

3. The Permittee shall install and operate a NO_x CEMS in accordance with 40 CFR §60.4345 Subpart KKKK.

4. The Permittee shall submit an emissions monitoring plan to the commissioner of the DEP and the Administrator of the US EPA, in accordance with RCSA §22a-174-22b(1)(2), within the earlier of 90 unit operating days or 180 calendar days from unit start-up.

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART IV. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS, cont.

B. Record Keeping

1. The Permittee shall keep records of annual fuel consumption. Annual fuel consumption shall be based on any consecutive 12 month time period and shall be determined by adding the current month's fuel usage to that of the previous 11 months. The Permittee shall make these calculations within 30 days of the end of the previous month.

2. The Permittee shall maintain records of all tune-ups, repairs, replacement of parts and other maintenance to this source and control equipment.

3. The Permittee shall keep all records required by this permit for a period of no less than five years and shall submit such records to the commissioner upon request.

C. Reporting

1. The Permittee shall submit all required reports to the Commissioner as required pursuant to Section 22a-174-22(l) and 40 CFR 60.4375(a), Subpart KKKK.

PART V. ALLOWABLE EMISSION LIMITS

The Permittee shall not exceed the emission limits stated herein at any time.

Combustion Turbine #1

Criteria Pollutants	lb/hr	tpy
PM	1.55	6.78
PM-10	1.55	6.78
PM-2.5	1.55	6.78
SO_x	0.245	1.07
NO_x	1.62	7.08
VOC	0.161	0.705
CO	0.982	4.3

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART V. ALLOWABLE EMISSION LIMITS, continued

Supplemental Burner

Criteria Pollutants	lb/hr	tpy
PM	0.211	0.925
PM-10	0.211	0.925
PM-2.5	0.211	0.925
SO_x	0.0147	0.0644
NO_x	0.409	1.79
VOC	0.0202	0.0866
CO	0.206	0.902

Total Emissions (Combustion Turbine #1 and Supplemental Firing)

Criteria Pollutants	lb/hr	lb/MMBtu	ppmvd @ 15% O_2	tpy
PM	1.76	0.0088		7.71
PM-10	1.76	0.0088		7.71
PM-2.5	1.76	0.0088		7.71
SO_x	0.259	0.0014		1.14
NO_x	2.03	0.0093	2.5	8.87
VOC	0.181			0.793
CO	1.19			5.20

Hazardous Air Pollutants	MASC * (μg/m^3)
Sulfuric Acid	723.89
Arsenic	1.81
Beryllium	0.36
Chromium	90.49
Nickel	180.97
Cadmium	14.48
Formaldehyde	434.34
Copper	72.39
Ammonia	13030.06

*Maximum allowable stack concentration

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART V. ALLOWABLE EMISSION LIMITS, continued

Demonstration of compliance with the above emission limits shall be met by calculating the emission rates using emission factors from the following sources:

1. Manufacturer's Data
2. AP-42, April 2000, Combustion Turbines
3. Fuel sulfur content of <0.003%

The above statement shall not preclude the commissioner from requiring other means (e.g. stack testing) to demonstrate compliance with the above emission limits, as allowed by state or federal statute, law or regulation.

PART VI. STACK EMISSION TEST REQUIREMENTS (Applicable if -X- Checked)

Stack emission testing shall be required for the following pollutant(s):

☐ None at this time

☒ PM-2.5 ☐ SOx ☒ NOx ☒ CO ☒ VOC ☐ Pb

☐ Other (HAPs): ________, ________,

(See Appendix B for General Requirements)

Initially, testing for filterable PM-2.5 will be required. Within one year following the US EPA's promulgation of a condensable PM-2.5 reference test method, the Permittee shall test for both filterable and condensable PM-2.5.

The initial NO_x performance testing shall be performed in accordance with 40 CFR §60.4405 Subpart KKKK.

Stack testing for CO and VOC shall be performed every five (5) years from the date of the initial test.

PART VII. APPLICABLE REGULATORY REFERENCES

RCSA §§22a-174-3a; 22a-174-18; 22a-174-19; 22a-174-29(b); 22a-174-22

These references are not intended to be all inclusive - other sections of the regulations may apply.

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART VIII. SPECIAL REQUIREMENTS

A. For this CHP Project, the Permittee shall be utilizing internal offsets to net out of major NSR requirements. These internal offsets are the result of the decommissioning of seven (7) diaper machines (in 2004), decommissioning of Boiler #1 (R-130-0017) and Boiler #2 (R-130-0018), as well as modifications to Tissue Machine Hood Burner #1 (P-130-0026) and Tissue Machine Hood Burner #2 (P-130-0014). The diaper machines #1-#4 were registered sources (R-130-0062, -0063, -0064, -0065) and #5-#7 were exempt units. The following tentative milestone schedule shall be adhered to as closely as possible for the start-up of the new/modified equipment and decommissioning of the old equipment.

1. Combustion Turbine #2 (P-130-0071), start-up - **April 2008**
2. Combustion Turbine #1 (P-130-0070), start-up - **July 2008**
3. Tissue Hood Burner #1 (P-130-0026), hood and burner upgrade - **2nd quarter 2008**
4. Tissue Hood Burner #2 (P-130-0014), hood and burner upgrade - **3rd quarter 2008**
5. Boiler #2, decommissioning - **April 2008**
6. Boiler #1, decommissioning - **90 days after the start-up of the HRSG associated with CT #1, around October 2008.**

No later than 180 days following the start-up of Combustion Turbine #2 (P-130-0018), Boilers #1 and #2 shall be decommissioned and the modifications to Tissue Hood Burners #1 and #2 shall be complete.

The Permittee shall notify the Department in writing within fifteen days of meeting each of the above milestones.

B. The Permittee shall operate and maintain this source and control equipment in accordance with the manufacturer's specifications and written recommendations.

C. *Noise (for non-emergency use)*

The Permittee shall operate this facility at all times in a manner so as not to violate or contribute significantly to the violation of any applicable state noise control regulations, as set forth in RCSA Sections 22a-69-1 through 22a-69-7.4.

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART VIII. SPECIAL REQUIREMENTS, continued

D. The Permittee shall comply with all applicable sections of the following New Source Performance Standard(s) at all times. (Applicable if -X- checked)

40 CFR Part 60, Subpart: ☐ Db ☐ Dc ☒ KKKK ☒ A

☐ None

(See Appendix C for Detailed Requirements)

E. The Permittee shall comply with all applicable sections of the following National Emission Standards for Hazardous Air Pollutants at all times. (Applicable if -X- checked)

40 CFR Part 63, Subpart: ☐ DDDDD ☐ A

PART IX. ADDITIONAL TERMS AND CONDITIONS

A. This permit does not relieve the Permittee of the responsibility to conduct, maintain and operate the regulated activity in compliance with all applicable requirements of any federal, municipal or other state agency. Nothing in this permit shall relieve the Permittee of other obligations under applicable federal, state and local law.

B. Any representative of the DEP may enter the Permittee's site in accordance with constitutional limitations at all reasonable times without prior notice, for the purposes of inspecting, monitoring and enforcing the terms and conditions of this permit and applicable state law.

C. This permit may be revoked, suspended, modified or transferred in accordance with applicable law.

D. This permit is subject to and in no way derogates from any present or future property rights or other rights or powers of the State of Connecticut and conveys no property rights in real estate or material, nor any exclusive privileges, and is further subject to any and all public and private rights and to any federal, state or local laws or regulations pertinent to the facility or regulated activity affected thereby. This permit shall neither create nor affect any rights of persons or municipalities who are not parties to this permit.

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF AIR MANAGEMENT

PART IX. ADDITIONAL TERMS AND CONDITIONS, continued:

E. Any document, including any notice, which is required to be submitted to the commissioner under this permit shall be signed by a duly authorized representative of the Permittee and by the person who is responsible for actually preparing such document, each of whom shall certify in writing as follows: "I have personally examined and am familiar with the information submitted in this document and all attachments thereto, and I certify that based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement made in the submitted information may be punishable as a criminal offense under section 22a-175 of the Connecticut General Statutes, under section 53a-157b of the Connecticut General Statutes, and in accordance with any applicable statute."

F. Nothing in this permit shall affect the commissioner's authority to institute any proceeding or take any other action to prevent or abate violations of law, prevent or abate pollution, recover costs and natural resource damages, and to impose penalties for violations of law, including but not limited to violations of this or any other permit issued to the Permittee by the commissioner.

G. Within 15 days of the date the Permittee becomes aware of a change in any information submitted to the commissioner under this permit, or that any such information was inaccurate or misleading or that any relevant information was omitted, the Permittee shall submit the correct or omitted information to the commissioner.

H. The date of submission to the commissioner of any document required by this permit shall be the date such document is received by the commissioner. The date of any notice by the commissioner under this permit, including but not limited to notice of approval or disapproval of any document or other action, shall be the date such notice is personally delivered or the date three days after it is mailed by the commissioner, whichever is earlier. Except as otherwise specified in this permit, the word "day" means calendar day. Any document or action which is required by this permit to be submitted or performed by a date which falls on a Saturday, Sunday or legal holiday shall be submitted or performed by the next business day thereafter.

I. Any document required to be submitted to the commissioner under this permit shall, unless otherwise specified in writing by the commissioner, be directed to: Office of Director; Engineering & Enforcement Division; Bureau of Air Management; Department of Environmental Protection; 79 Elm Street, 5th Floor; Hartford, Connecticut 06106-5127.

DRAFT

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

Appendices attached (Applicable if -X- checked):

☒ A Continuous Emission Monitoring Requirements

☒ B Stack Emission Test Requirements

☐ C New Source Performance Standards

☒ E Control Equipment Design Specifications

DRAFT

APPENDIX E
Control Equipment Design Specifications

Air Pollution Control Equipment (applicable if -X- checked).

The following specifications need not be verified on a continuous basis, however, if requested by the Bureau, demonstration shall be shown.

☐ None

☐ Scrubber

Make and Model: ________
Reagent: ________
Reagent Flow Rate: ________
Pressure Drop (in H_2O): ________
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): ________
PH: ________
Design Outlet Grain Loading (gr/dscf): ________
Design Removal Efficiency (%) : ________

☐ Electrostatic Precipitator (ESP)

Make and Model: ________
Number of Fields: ________
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): ________
Design Outlet Grain Loading (gr/dscf): ________
Design Removal Efficiency (%): ________

☐ Cyclone ☐ Multicyclone

Make and Model: ________
Pressure Drop (in H_2O): ________
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): ________

☐ Selective Non-catalytic Reduction (SNCR)

☐ Urea ☐ Ammonia

Make and Model: ________
Injection Rate at Maximum Rated Capacity (lb/hr): ________
Operating Temperature Range (°F): ________
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): ________
Design Removal Efficiency (%): ________

☒ Selective Catalytic Reduction (SCR)

Make and Model: Cormetech CM-21
Catalyst Type: Homogeneous Honeycomb
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): 349,386
Pressure Drop (in H_2O): 3.4 @ 425,050 lb/h, 429°F
Ammonia Injection Rate at Maximum Rated Capacity (lb/hr): 70 lb/h max diluted
Design Specification: $\leq$ 2.5 ppmvd NO_x corrected to 15% O_2

DRAFT

APPENDIX E
Control Equipment Design Specifications

☐ Low NOx Burner

Make and Model: ______________________
Guaranteed NOx Emission Rate (lb/MM BTU): ______________________
Design Removal Efficiency (%): ______________________

☐ Particulate Trap

Make and Model: ______________________
Design Removal Efficiency (%): ______________________

☐ Fabric Filter

Make and Model: ______________________
Number of Bags in Use: ______________________
Bag Material: ______________________
Air/Cloth Ratio: ______________________
Net Cloth Area (ft^2): ______________________
Cleaning Method: ______________________
Pressure Drop (in H_2O): ______________________
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): ______________________
Design Outlet Grain Loading (gr/dscf): ______________________
Design Removal Efficiency (%): ______________________

☒ Other: EmeraChem Moduler ADCAT Catalytic Oxidizer, Design Removal Efficiency: ≥90% (CO), ≥85% (VOC)

Attachment F

M.I. HOLZMAN
& ASSOCIATES, LLC

Environmental Engineering ■ Impact Assessment ■ Compliance Services

July 23, 2007

Mr. James Grillo
Connecticut Department of Environmental Protection
Bureau of Air Management
79 Elm Street
Hartford, CT 06106-5127

Re: Plainfield Renewable Energy LLC
Application for Air Permit to Construct and Operate
CTDEP Application No. 200602226
Revised $PM_{2.5}$ Emissions Rates and NAAQS Compliance Demonstration

Dear Mr. Grillo:

This letter and attachments are submitted on behalf of Plainfield Renewable Energy LLC (PRE) to amend information contained in the above-referenced air permit application, dated August 8, 2006. Specifically, PRE is revising its proposed $PM_{2.5}$ emission rates for the fluid bed gasifier (FBG) and emergency diesel generator to include the estimated condensable fraction of $PM_{2.5}$ (the previous $PM_{2.5}$ emission rates only included the filterable fraction as determined by EPA Reference Method 5). In addition, the multiple-source air quality impact analysis for $PM_{2.5}$ has been updated to demonstrate compliance with the revised 24-hour average $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS), which became effective December 18, 2006, after PRE's submittal of its air quality impact analysis for the proposed project. As further discussed herein, the updated analysis includes a revised estimate of the 24-hour average $PM_{2.5}$ ambient background concentration based on 2004 to 2006 monitored values (previously based on 2003 to 2005 data) as well as an updated site plan. Finally, the draft version of the permit is attached, which includes proposed language on the enforceability of the $PM_{2.5}$ emission limit and additional comments based on our review of your previous draft.

<u>Background</u>

PRE's Air Quality Impact Analysis submitted to CTDEP on December 7, 2006 included a demonstration of compliance with the 24-hour $PM_{2.5}$ NAAQS of 65 $\mu g/m^3$ rather than the revised 24-hour standard of 35 $\mu g/m^3$, which had an effective date of December 18, 2006. Based on CTDEP guidance available at that time, it was PRE's understanding that permit applications currently under review would be reviewed using the PM_{10} standard as a surrogate for $PM_{2.5}$ compliance until such time that CT's State Implementation Plan (SIP) was revised to implement the $PM_{2.5}$ standards. PRE has recently learned of CTDEP's plan to implement Interim $PM_{2.5}$ New Source Review Modeling Policy and Procedures[1], which would require applicants to demonstrate compliance with the revised $PM_{2.5}$ NAAQS before CTDEP proposes and EPA approves the required SIP revision. CTDEP's draft policy also requires that condensable PM emissions be included in the $PM_{2.5}$ emission rate in addition to the filterable fraction. Ongoing discussion among CTDEP, regulated industry and other interested

[1] Current draft for comment dated June 13, 2007.

57 Mountain View Drive
West Hartford, CT 06117-3028

Phone: 860-523-8345
Fax: 860-523-8394
Mholzman2@comcast.net

parties has highlighted some of the technical difficulties in the accurate measurement of condensable PM emissions from certain combustion sources and associated lack of reliable emissions data. Artifacts or biases of the current reference test method (Method 202) for condensable PM emissions have resulted in extremely variable and unreliable test results. Accordingly, boiler and particulate control equipment vendors are not willing to guarantee condensable PM emissions, which severely affects project financability, should a condensable PM emission rate be an enforceable permit condition. PRE is confident that CTDEP will ultimately take these issues into consideration as it finalizes the $PM_{2.5}$ modeling policy so that permits can be written in a practically-enforceable manner and that projects can secure financing.

PRE's understanding of CTDEP's current (unofficial) thinking is that permits under review before the SIP is revised to implement the $PM_{2.5}$ standards would contain an enforceable limit for filterable $PM_{2.5}$ along with an estimate of condensable PM2.5, but that permittees would only need to comply with the filterable $PM_{2.5}$ until such date that an EPA reference method is available to accurately measure the condensable fraction. PRE also understands that applicants would be required to demonstrate compliance with the NAAQS for $PM_{2.5}$ using a best estimate of total $PM_{2.5}$, including the estimated condensable fraction. In accordance with this understanding, this letter and attachments provide:

1. Proposed enforceable permit limit for filterable $PM_{2.5}$;
2. Estimated emission rates for condensable $PM_{2.5}$ and total $PM_{2.5}$, including condensables;
3. Updated air quality impact analysis demonstrating compliance of total estimated $PM_{2.5}$ emissions impact with the revised NAAQS for $PM_{2.5}$ (includes updated estimate of representative $PM_{2.5}$ ambient background concentration, revised location of emergency diesel engine generator and other site plan revisions not significantly affecting the dispersion modeling analysis); and
4. Proposed edits to draft air permit.

Proposed $PM_{2.5}$ Filterable Emission Limit and Estimated $PM_{2.5}$ Condensable Emission Rate

The air permit application filed August 8, 2006 proposed a PM_{10} emission rate of 0.02 lb/MMBtu for the FBG, to be achieved with a multi-cyclone and baghouse filter as BACT. The PM_{10} emission rate was based on filterable PM as measured by EPA Reference Method 5 as specified in the Boiler MACT (Subpart DDDDD of Part 63). Subsequent to CTDEP's request to provide a separate $PM_{2.5}$ emission rate, PRE has determined, based on discussion with the boiler vendor, that the filterable fraction of $PM_{2.5}$ would be equivalent to the filterable fraction of PM_{10} emissions controlled with a baghouse. Therefore, the filterable $PM_{2.5}$ emission rate would be equivalent to the initially proposed PM_{10} emission rate of 0.02 lb/MMBtu.

As discussed above, measurements of the condensable fraction of PM2.5 emissions from wood boilers have been highly variable and subject to artifacts of the current EPA test method (Reference Method 202). As a result, boiler vendors have been unable to provide guarantees on the condensable $PM_{2.5}$ or total $PM_{2.5}$ emission rates, especially for sources employing ammonia-based NO_X control systems or involving SO_2 and HCl emissions. For purposes of evaluating the $PM_{2.5}$ ambient impacts, PRE understands that applicants in the interim (while a revised $PM_{2.5}$ test method is being developed) should use best estimates of the $PM_{2.5}$ condensable emissions for $PM_{2.5}$ NAAQS compliance demonstrations. EPI, PRE's preferred boiler vendor, estimates the $PM_{2.5}$ condensable emissions at about 0.015 lb/MMBtu for PRE's application, not including the artifacts or biases of the current test method. EPI's estimated condensable $PM_{2.5}$ emission rate compares well with EPA's emission factor of 0.017 lb/MMBtu found in AP-42, Table 1.6-1 for all wood fuels and all controls/no controls. Accordingly, PRE's updated $PM_{2.5}$ ambient impact analysis is based on a condensable $PM_{2.5}$ emission rate of 0.017 lb/MMBtu and a total $PM_{2.5}$ (filterable + condensable) emission rate of 0.037 lb/MMBtu. Table 1 summarizes the revised emission rates for the project, including the $PM_{2.5}$ emissions.

$PM_{2.5}$ filterable and condensable emissions from the FBG startup burners using B100 biodiesel were also conservatively estimated using EPA AP-42 emission factors in Table 1.3-2 and 1.3-6 for distillate oil combustion. This analysis shows that filterable and condensable $PM_{2.5}$ emission rates from the startup burners fired alone or when firing B100 in the FBG along with wood fuel are estimated to be less than those from 100% wood fuel in the FBG. Therefore, the case of 100% wood fuel in the FBG was modeled in the updated $PM_{2.5}$ ambient impact analysis. Revised Table 2 summarizes the updated $PM_{2.5}$ emission rates from B100 firing in the startup burners.

PRE also evaluated the $PM_{2.5}$ emissions from the proposed diesel engine emergency generator and cooling tower for use in the updated $PM_{2.5}$ ambient impact analysis. Filterable $PM_{2.5}$ from the diesel engine is based on the <3 μm emission PM factor in AP-42 Table 3.4-2 for large uncontrolled stationary diesel engines (0.0479 lb/MMBtu). The condensable $PM_{2.5}$ fraction is based on the 0.0077 lb/MMBtu condensable particulate emission rate in the same table. Therefore, a total $PM_{2.5}$ emission rate of 0.0556 lb/MMBtu was used in the updated $PM_{2.5}$ impact analysis. Table 3 summarizes the updated emission factors for the diesel engine.

With regard to the wet cooling tower, no $PM_{2.5}$ or condensable PM emission factors were found in AP-42. However, as wet cooling towers operate at much closer to ambient air temperatures than the FBG stack or diesel engine, it can be assumed that the total PM_{10} emission factor is conservatively representative of total filterable + condensable PM. Therefore, PM_{10} emissions previously estimated for the cooling tower are believed to conservatively represent total $PM_{2.5}$ emissions.

Updated $PM_{2.5}$ Ambient Background Concentration Representative of Plainfield, CT

The ambient background $PM_{2.5}$ concentrations used in the updated modeling analysis to represent the Plainfield site were developed using the same procedures described in the December 2006 modeling report, but updated to incorporate the most recent three years of available monitoring data. Specifically, 2004 to 2006 $PM_{2.5}$ monitoring data from CTDEP's Norwich, CT and RIDEM's West Greenwich, RI monitoring stations were used. Figure 1 shows the locations of the Norwich and W. Greenwich monitoring locations in relation to the Plainfield site and Table 4 summarizes the 98th percentile 24-hour concentrations for each year at each site based on data retrieved from EPA's AirData website (http://www.epa.gov/air/data/monvals.html?st~CT~Connecticut). Based on the updated monitoring data, the 24-hour and annual average background concentrations used in the modeling analysis, based on the average of the two monitoring sites are 29 and 9 μg/m³, respectively.

Revised Site Plan

The site plan and building arrangements have been updated primarily to minimize wetlands encroachment. The site plan modifications that minimally affect the dispersion modeling analysis are a relocation of the diesel emergency generator from the original location near the cooling tower to a location near the west side of the Power House and a slight adjustment of the cooling tower location. In addition, the power house was moved 50 feet closer to the stack, the boiler inside the power house was turned 90 degrees and the FD Fan was moved inside the power house. The locations of the fuel piles were also adjusted. No building dimensions or structure sizes changed in plan or elevation. The revised site plan is provided in Attachment A to this letter.

To evaluate the effects of these minor site plan changes on the dispersion modeling results, test runs of the ISCST and PTMTPA models were conducted for the $PM_{2.5}$ impact analysis, using the original $PM_{2.5}$ (filterable only) emission rates for comparison to the previous model runs. The full 5-year meteorological data set (1970 – 1974) was used for the ISCST model runs to perform this evaluation. Comparison of the ISCST model results based on the modified site plan to the original model runs shows a slight reduction in maximum impacts.

The PTMTPA model was also run using the updated building and stack coordinates of the revised site plan. As with the ISCST model runs, the revised site plan generally resulted in slightly lower predicted impacts than with the original site plan.

Therefore, the revised site arrangement does not appear to affect the results of the original modeling analysis and the updated modeling was only performed to address $PM_{2.5}$ impacts using the revised $PM_{2.5}$ emission rates and estimated background concentrations. The comparison of impacts predicted for the two sets of ISCST and PTMTPA model runs are summarized in Table 5.

Updated $PM_{2.5}$ Ambient Impact Analysis

An updated ambient impact analysis was performed to demonstrate compliance with the revised $PM_{2.5}$ NAAQS based on the updated $PM_{2.5}$ emission rates and representative background concentrations as described above. As in the original PM_{10}/$PM_{2.5}$ multiple-source modeling analysis, the $PM_{2.5}$ modeling only addresses NAAQS compliance since the PSD increments and procedures for $PM_{2.5}$ have not been promulgated. In addition, the multiple-source modeling analysis only included the three PRE sources (FBG, emergency diesel generator and cooling tower) as no other sources in CTDEP's, RIDEM's or MADEP's inventories met the CTDEP criteria of greater than 15 TPY within the significant impact radius, greater than 50 TPY within 20 km or greater than 500 TPY within 50 km of the PRE site.

Maximum PTMTPA impacts for complex terrain receptors were originally predicted to occur on a hill located 2,500 meters to the southeast of the PRE site. Using the updated $PM_{2.5}$ emission rates for the FBG and emergency generator stacks and the revised emergency generator stack and cooling tower locations, the maximum 24-hour $PM_{2.5}$ PTMTPA impact (6.5 $\mu g/m^3$) is predicted to occur at the same receptor as originally modeled. Using interim (unofficial) guidance provided by CTDEP, a ratio was applied to the maximum 24-hour PTMTPA impact to better estimate the 98th percentile or

8^{th} high 24-hour impact. The ratio was derived by calculating the ratio of the 6th high to highest modeled ISC impacts (8^{th} high impacts are not estimated with the ISCST model) at the maximum impact receptor for each of the 5 years of meteorological data. The ratios ranged from 0.66 to 0.79 and averaged 0.75. Therefore, the maximum 24-hour $PM_{2.5}$ impact predicted by the PTMTPA model was multiplied by 0.75 to estimate the 98^{th} percentile or 8^{th} highest impact for comparison to the 24-hour NAAQS.

Separate sets of ISCST model runs were conducted to evaluate the 24-hour and annual average $PM_{2.5}$ impacts. 24-hour impacts for comparison to the NAAQS were evaluated using the highest 6^{th} highest impacts of any receptor determined over the 5-year period as the ISCST model does not allow calculation of the highest 8^{th} high averages. The same 5-year set of meteorological data used in the original analyses was used for the updated modeling.

The updated modeling results for both the ISCST and PTMTPA models are summarized in Table 6 and the results for the individual runs are summarized in Table 7. The updated modeling analysis demonstrates compliance with all applicable NAAQS and PSD increments based on the updated $PM_{2.5}$ emission rates, updated $PM_{2.5}$ background concentrations and revised site arrangement. A list of updated modeling input and output files is provided in Table 8 and copies of the modeling files will be provided electronically via email or CD.

Proposed $PM_{2.5}$ Permit Conditions and Other Edits

A copy of the most recent unofficial draft permit is provided in Attachment B, which includes additional PRE comments and suggested language to address the enforceability of the estimated condensable and total $PM_{2.5}$ emission rates. Specifically, notes have been added in Part VI, Allowable Emission Limits, to clarify that the condensable PM-2.5 and total PM-2.5, including condensables, are only estimated values based on the EPA AP-42 emission factor for condensable PM from wood residue (Table 1.6-1, Fifth Edition, September 2003 update). The notes further clarify that demonstration of compliance with the PM-2.5 condensable and total emission limits shall be met by calculating the emission rates using the referenced AP-42 emission factor. In addition, a note has been added under the stack test requirements in Part VII to clarify that particulate matter testing shall only include filterable particulate matter as measured by EPA Reference Method 5 or 17. Additional comments and suggested edits on other parts of the draft permit have been added based on input from PRE's engineer and proposed vendors.

We appreciate your efforts in providing a timely review of this additional information and revised analyses. Please do not hesitate to contact me with any questions or comments.

Sincerely,

M.I. Holzman & Associates, LLC

Michael I. Holzman
President

c: Jude Catalano, CTDEP
Daniel Donovan, PRE

Table 1 – Revised Proposed Controlled Potential Emissions

Pollutant	Biomass FBG Controlled Emission Factor (lb/MMBtu)	Biomass FBG Controlled Potential Emissions (lb/hr)	Biomass FBG Controlled Potential Emissions (TPY)	Diesel Engine Emergency Generator (TPY)	Cooling Tower (TPY)	Total Premise Controlled Potential Emissions (TPY)	CTDEP Major Stationary Source Threshold (TPY)	PSD Significant Emission Rate (TPY)
PM/PM_{10}	0.02	10.46	45.82	0.044	0.65	46.52	100	25/15
PM2.5 filterable[1]	0.02	10.46	45.82	0.037	0.65	46.52		
PM2.5 condensable[2]	0.017	8.89	38.95	0.006		38.96		
PM2.5 Total	0.037	19.35	84.77	0.043	0.65	85.47	100	10
NO_X	0.075	39.23	171.84	2.414		174.25	50	40
SO_X	0.035	18.56	81.29	0.001		81.29	100	40
CO	0.105	54.67	239.47	0.553		240.02	100	100
VOC	0.012	6.07	26.59	0.071		26.66	50	25
CO_2	212	110,965	486,026	116.7		486142.28		
Pb	1.4E-04	0.07	0.32	7.0E-06		0.32	10	0.6
HCl	1.3E-02	6.94	30.38			30.38		
H_2SO_4	2.8E-03	1.48	6.50			6.50	100	7
NH_3	1.5E-02	7.79	34.1			34.11		
Hg	2.53E-06	0.0013	0.006			0.006	10	0.1
Dioxins[3]	8.70E-11	4.6E-08	2.0E-07			2.0E-07	10	3.5E-06

1. PM2.5 emissions conservatively assumed to be equal to PM10 emissions and based on filterable fraction as measured by EPA Method 5.
2. Condensable PM2.5 emission factor based on boiler vendor (EPI) estimate and EPA AP42, Table 1.6-1.
3. Dioxins emissions expressed in terms of 2,3,7,8 dibenzo-p-dioxin equivalents, as defined in RCSA 22a-174-1. PSD Significant Emission Rate expressed in terms of total tetra-through octa-chlorinated dibenzo-p-dioxins and furans.

Table 2 - Estimated Emissions from B100 Biodiesel-Fired Startup Burners

Input Data	
Fuel	Biodiesel B100
MMBtu/hr, Total 2 burners	100
specific gravity	0.88
Btu/lb (HHV)	17,447
Btu/gal (HHV)	128,047
gal/hr	781
Potential hrs/yr	8,760
gal/yr	6,841,237
MMBtu/yr (Potential)	876,000
Stack Temp., deg. F[1]	253
Flue gas rate, ACFM[1,2]	25,992
Stack Height, ft.	155
Stack diameter, ft.	9
Stack exit velocity, ft/s	6.8

Note: Estimates of potential emissions from B100 biodiesel-fired FBG startup burners demonstrate that startup emissions for all pollutants will be lower than emissions during normal operations of the FBG energy system when using biomass.

B100 Biodiesel Firing During FBG Startup Only					
Pollutant	**B100 Biodiesel Emission Factor lb/kgal[1]**	**B100 Biodiesel Emission Factor lb/MMBtu**	**Potential lb/hr**	**Potential TPY**	**Emission Factor Source[3]**
PM/PM10	1	0.01	0.78	3.42	BACT (baghouse)
PM2.5 filterable	0.25	0.002	0.20	0.86	BACT (baghouse)
PM2.5 condensable	1.3	0.010	1.02	4.45	BACT (baghouse)
PM2.5 Total	1.55	0.012	1.21	5.30	BACT (baghouse)
NO_X	20	0.16	15.62	68.41	AP-42 1.3
SO_X[4]	0.21	0.0017	0.17	0.73	AP-42 1.3
CO	5	0.04	3.90	17.10	AP-42 1.3
VOC	0.34	0.0027	0.27	1.16	AP-42 1.3
Pb		0.00E+00	0.0E+00	0.0E+00	AP-42 1.3

Table 3 – Estimated Emissions, Emergency Diesel Engine Generator

Generator Manufacturer	Caterpillar or equivalent	
Model Number	CAT C15 ATAAC or equivalent	
Serial Number	TBD	
Installation Date	3/1/2007	
Fuel Burned	Ultra low Sulfur Diesel Oil	
Fuel Heat Content, Btu/gal	138,000	
% Sulfur in Fuel	0.0015%	
Max. Rating, kW	500	
Max. Rating, Bhp	671	Estimated (1.341 x kW)
Max Fuel, MMBtu/hr	5.16	
Max Fuel, Gal/hr	37.4	
Max. Annual Operating Hours	300	
Annual Fuel Use, Gal/yr	11,220	
Exhaust Gas Volume, acfm	3927	
Exhaust Stack diam., ft.	0.5	
Exhaust Gas Temp., F	948	

Estimated Potential and Actual Emission Calculations @ 300 hours per year maximum operation

Pollutant	Emission Factor (lb/1000 gal)	Emission Factor (lb/bhp-hr)	Emission Factor (lb/MMBtu)	Potential Emissions (lb/hr)	Potential Emissions (8760 hrs) (tons/yr)	Allowable[1] Emissions (tons/yr)	Emission Factor Source
PM-10			0.0573	0.30	1.30	0.044	AP-42, Table 3.4-2
PM2.5 filterable			0.048	0.25	1.09	0.037	AP-42, Table 3.4-2
PM2.5 condensable			0.0077	0.04	0.17	0.006	AP-42, Table 3.4-2
PM2.5 Total			0.0557	0.29	1.26	0.043	AP-42, Table 3.4-2
NO_X		0.0240		16.09	70.48	2.41	AP-42, Table 3.4-1
SO_X	0.21			0.008	0.03	0.001	CTDEP Default (141*S)
CO		0.0055		3.69	16.15	0.55	AP-42, Table 3.4-1
VOC		0.00071		0.47	2.07	0.07	AP-42, Table 3.4-1
Pb	1.24E-03			4.6E-05	2.0E-04	7.0E-06	AP-42 T 1.3-10 (9/98)
CO_2		1.16		778	3407	116.7	AP-42, Table 3.4-1

1. Allowable emissions with maximum 300 hours per consecutive 12-month period per RCSA 22a-174-3b(e) permit exemption criteria for "emergency" engines.

Table 4 – Calculation of Representative Background Ambient Concentrations for Plainfield, CT

PM2.5 (24-hr) - average of 98th percentile over 3 years (ug/m3)

Monitor	90113002	440030002	
2006	28	21	
2005	35	32	
2004	31	28	
avg	31.33	27.00	
avg. of sites			29

PM2.5 (annual) - average of annual averages over 3 years (ug/m3)

Monitor	90113002	440030002	
2006	10.2	7.5	
2005	11.7	8.3	
2004	10.9	8	
avg	10.93	7.93	
avg. of sites			9

90113002 = Norwich, CT
440030002 = W. Greenwich, RI

Table 5– Comparison of PTMTPA and ISCST $PM_{2.5}$ Impacts for Original and Revised Site Plans

Original Site Plan:

	PM2.5 AAQS Analysis										
	PTMTPA Multi-Source Impacts at Complex Terrain Receptors ($\mu g/m^3$) [1,2]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	Recept. 1 - 30	Recept. 31-60	Recept. 61-90	Recept. 91-120	Recept. 121-150	Recept. 1 51	Max.	East (m)	North (m)		
1-hour average	25.6	34.4	28.9	18.9	14.4	3.3	34.4	758,261.3	4,615,647.5	2500	120
3-hour average	23.0	31.0	26.0	17.0	13.0	3.0	31.0	758,261.3	4,615,647.5	2500	120
8-hour average	17.9	24.1	20.2	13.2	10.1	2.3	24.1	758,261.3	4,615,647.5	2500	120
24-hour average	4.0	5.0	4.0	3.0	2.0	0.0	5.0	758,261.3	4,615,647.5	2500	120
Annual average	1.0	1.3	1.0	0.8	0.5	0.0	1.3	758,261.3	4,615,647.5	2500	120

	ISCST PM2.5 Impacts, Annual Average ($\mu g/m^3$)					Max.	Max. Year	UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974			East (m)	North (m)		
PRE FBG Stack	0.28	**0.29**	0.25	0.27	0.23	0.29	1971	758,261.3	4,615,647.5	2500	120
PRE Emergency Generator	0.06	**0.07**	0.06	0.06	0.06	0.07	1971	756,121.1	4,616,770.5	129	169
PRE Cooling Tower	0.03	**0.03**	0.03	0.03	0.03	0.03	1971	756,121.1	4,616,770.5	129	169
Total PRE Sources	0.28	**0.29**	0.26	0.27	0.24	0.29	1971	758,261.3	4,615,647.5	2500	120
Total Combined AAQS Sources	0.28	**0.29**	0.26	0.27	0.24	0.29	1971	758,261.3	4,615,647.5	2500	120
Total Combined PSD Sources						0.00					

	ISCST PM2.5 Impacts, 24-hr Average ($\mu g/m^3$)					Max.	Max. Year	UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974			East (m)	North (m)		
PRE FBG Stack	1.27	1.26	**1.46**	1.21	1.05	1.46	1972	758,261.3	4,615,647.5	2500	120
PRE Emergency Generator	5.89	5.95	6.19	**6.69**	6.15	6.69	1973	756,015.1	4,616,892.0	81	266
PRE Cooling Tower	0.20	**0.21**	0.20	0.19	0.21	0.21	1971	756,138.3	4,616,775.0	130	161
Total PRE Sources	6.05	6.05	6.40	**6.71**	6.15	6.71	1973	756,015.1	4,616,892.0	81	266
Total Combined AAQS Sources	6.05	6.05	6.40	**6.71**	6.15	6.71	1973	756,015.1	4,616,892.0	81	266
Total Combined PSD Sources						0.00					

Revised Site Plan:

	PM2.5 AAQS Analysis										
	PTMTPA Multi-Source Impacts at Complex Terrain Receptors (μg/m³) [1,2]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	Recept. 1 - 30	Recept. 31-60	Recept. 61-90	Recept. 91-120	Recept. 121-150	Recept. 1 51	Max.	East (m)	North (m)		
1-hour average	25.2	33.9	28.1	18.2	14.0	3.0	33.9	758,261.3	4,615,647.5	2500	120
3-hour average	22.7	30.5	25.3	16.4	12.6	2.7	30.5	758,261.3	4,615,647.5	2500	120
8-hour average	17.7	23.7	19.7	12.8	9.8	2.1	23.7	758,261.3	4,615,647.5	2500	120
24-hour average	4.2	5.3	4.4	3.1	2.4	0.0	5.3	758,261.3	4,615,647.5	2500	120
Annual average	1.1	1.3	1.1	0.8	0.6	0.0	1.3	758,261.3	4,615,647.5	2500	120

	ISCST PM2.5 Impacts, Annual Average (μg/m³)					Max.	Max. Year	UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974			East (m)	North (m)		
PRE FBG Stack	0.28	**0.29**	0.25	0.27	0.23	0.29	1971	758,261.3	4,615,647.5	2500	120
PRE Emergency Generator	0.05	**0.05**	0.05	0.05	0.05	0.05	1971	756,121.1	4,616,770.5	129	169
PRE Cooling Tower	0.03	**0.03**	0.03	0.03	0.03	0.03	1971	756,140.8	4,616,794.5	112	157
Total PRE Sources	0.28	**0.29**	0.25	0.27	0.24	0.29	1971	758,261.3	4,615,647.5	2500	120
Total Combined AAQS Sources	0.28	**0.29**	0.25	0.27	0.24	0.29	1971	758,261.3	4,615,647.5	2500	120
Total Combined PSD Sources						0.00					

	ISCST PM2.5 Impacts, 24-hr Average (μg/m³)					Max.	Max. Year	UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974			East (m)	North (m)		
PRE FBG Stack	1.27	1.25	**1.45**	1.21	1.04	1.45	1972	758,261.3	4,615,647.5	2500	120
PRE Emergency Generator	5.04	5.21	5.31	**5.47**	5.43	5.47	1973	756,015.1	4,616,892.0	81	266
PRE Cooling Tower	0.21	0.21	**0.22**	0.21	0.21	0.22	1972	756,140.8	4,616,794.5	112	157
Total PRE Sources	5.15	5.35	5.37	**5.54**	5.49	5.54	1973	756,015.1	4,616,892.0	81	266
Total Combined AAQS Sources	5.15	5.35	5.37	**5.54**	5.49	5.54	1973	756,015.1	4,616,892.0	81	266
Total Combined PSD Sources						0.00					

1. For ISCST model results, highest 6th high modeled concentrations were used to evaluate PM2.5 impacts (8th highest values are not an option with ISCST). Highest modeled concentrations were used to evaluate annual impacts.

2. PTMTPA-CONN provides maximum 3-hour and 24-hour concentrations for each receptor modeled. 1-hour and 8-hour concentrations were calculated by dividing the 3-hour value by 0.9 to calculate a 1-hour average, and then multiplying the 1-hour value by 0.7 to calculate an 8-hour average. Annual average concentrations were estimated by multiplying the maximum 24-hour concentration by 0.25 (the maximum ratio of the annual to 24-hr second high concentration modeled with ISCST was 0.2 at the maximum PTMTPA impact receptor). Maximum modeled results from all receptors were used to evaluate impacts for each averaging period, with the exception of PM2.5. For PM2.5, the PTMTPA model results were multiplied by a factor of 0.75 to estimate the 98th percentile or 8th high 24-hour impacts. The 0.75 ratio was derived by calculating the ratio of the 6th high to highest modeled ISC impacts at the maximum impact receptor for each of the 5 years of meteorological data. The ratios ranged between 0.66 to 0.79 and averaged 0.75. (The 0.75 factor has not been applied to the raw model results summarized above).

Table 6 – Summary of Updated Refined ISCST and PTMTPA Multiple-Source Modeling Analysis

ISCST Modeled Impacts

Pollutant	Averaging Period	Max. Impact AAQS Sources ($\mu g/m^3$)[1]	Max. Impact PSD Increment Consuming Sources ($\mu g/m^3$)[1]	Class II Allowable PSD Increments. ($\mu g/m^3$)	Background Conc. ($\mu g/m^3$)[3]	Total Conc. ($\mu g/m^3$)	AAQS ($\mu g/m^3$)	Receptor Location of Maximum Impact: UTM East (m)	Receptor Location of Maximum Impact: UTM North (m)	Receptor Location of Maximum Impact: Distance from Stack (m)	Receptor Location of Maximum Impact: Azimuth, degrees from N.	Year
PM2.5	24-hour average	3	N/A	N/A	29	32	35	756,015	4,616,892	81	266	1973
	Annual average	1	N/A	N/A	9	10	15	758,261	4,615,648	2,500	120	1971
NO_2 *	Annual average	3	2	25	33	36	100	746,361	4,613,354	10,360	250	1970
SO_2 **	3-hour average	174	36	512	92	266	1300	746,361	4,613,354	10,360	250	1973
	24-hour average	71	9	91	55	126	260	746,361	4,613,354	10,360	250	1972
	Annual average	9	1	20	11	20	60	746,361	4,613,354	10,360	250	1970

* Receptor location and year of maximum impact listed for cumulative AAQS sources. For PSD increment consuming sources, maximum modeled impact receptor was (X, Y, Dist., Azimuth, Year):

756,121 4,616,771 129.4 168.9 1971

** Receptor locations and years of maximum impact listed for cumulative AAQS sources. For PSD increment consuming sources, maximum modeled impact receptors were (X, Y, Dist., Azimuth, Year):

	X	Y	Dist.	Azimuth	Year
3-hour:	738,045	4,613,715	18,330	260	1974
24-hour:	740,222	4,607,733	18,330	240	1971
annual:	740,222	4,607,733	18,330	240	1970

PTMTPA-CONN Modeled Impacts

Pollutant	Averaging Period	Max. Impact AAQS Sources ($\mu g/m^3$)[2]	Max. Impact PSD Increment Consuming Sources ($\mu g/m^3$)[2]	Class II Allowable PSD Increments. ($\mu g/m^3$)	Background Conc. ($\mu g/m^3$)[3]	Total Conc. ($\mu g/m^3$)	AAQS ($\mu g/m^3$)	Receptor Location of Maximum Impact: UTM East (m)	Receptor Location of Maximum Impact: UTM North (m)	Receptor Location of Maximum Impact: Distance from Stack (m)	Receptor Location of Maximum Impact: Azimuth, degrees from N.
PM2.5	24-hour average	6	N/A	N/A	29	35	35	758,261	4,615,648	2500	120
	Annual average	2	N/A	N/A	9	12	15	758,261	4,615,648	2500	120
NO_2	Annual average	4	4	25	33	37	100	758,261	4,615,648	2500	120
SO_2	3-hour average	132	46	512	92	224	1300	758,261	4,615,648	2500	120
	24-hour average	29	9	91	55	84	260	758,261	4,615,648	2500	120
	Annual average	7	2	20	11	18	60	758,261	4,615,648	2500	120

Maximum of ISCST-PRIME and PTMTPA Impacts

Pollutant	Averaging Period	Max. Impact AAQS Sources ($\mu g/m^3$)[1,2]	Max. Impact PSD Increment Consuming Sources ($\mu g/m^3$)[1,2]	Class II Allowable PSD Increments. ($\mu g/m^3$)	Background Conc. ($\mu g/m^3$)[3]	Total Conc. ($\mu g/m^3$)	AAQS ($\mu g/m^3$)
PM2.5	24-hour average	6	N/A	N/A	29	35	35
	Annual average	2	N/A	N/A	9	12	15
NO_2	Annual average	4	4	25	33	37	100
SO_2	3-hour average	174	46	512	92	266	1300
	24-hour average	71	9	91	55	126	260
	Annual average	9	2	20	11	20	60

1. For ISCST model results, highest second high modeled concentrations were used to evaluate all short-term impacts (1-hour to 24-hour), with the exception of PM2.5. For PM2.5, highest 6th high modeled concentrations were conservatively used (8th highest values are not an option with ISCST). Highest modeled concentrations were used to evaluate annual impacts.

2. PTMTPA-CONN provides maximum 3-hour and 24-hour concentrations for each receptor modeled. 1-hour and 8-hour concentrations were calculated by dividing the 3-hour value by 0.9 to calculate a 1-hour average, and then multiplying the 1-hour value by 0.7 to calculate an 8-hour average. Annual average concentrations were estimated by multiplying the maximum 24-hour concentration by 0.25 (the maximum ratio of the annual to 24-hr second high concentration modeled with ISCST was 0.2 at the maximum PTPTPA impact receptor). Maximum modeled results from all receptors were used to evaluate impacts for each averaging period, with the exception of PM2.5. For PM2.5, the PTMTPA model results were multiplied by a factor of 0.75 to estimate the 98th percentile or 8th high 24-hour impacts. The 0.75 ratio was derived by calculating the ratio of the 6th high to highest modeled ISC impacts at the maximum impact receptor for each of the 5 years of meteorological data. The ratios ranged between 0.66 to 0.79 and averaged 0.75. (The 0.75 factor has not been applied to the raw model results summarized above).

3. With exceptions noted as follows, background concentrations were obtained from the 2003-2005 average values from the 3 CT monitoring sites nearest to the project site (data provided by CTDEP). For PM2.5, background concentrations were obtained from the average of 2004-2006 data from the Norwich, CT and West Greenwich, RI monitoring sites. For PM10, the 24-hour background concentration was obtained from the average of the 2003-2005 values from East Hartford, CT and W. Greenwich, RI. The PM10 annual background concentration was obtained from the average of the 2003-2005 values from Waterbury,CT and W. Greenwich, RI.

Table 7 – PTMTPA and ISCST Modeling Output Summary

	NO2 AAQS Analysis										
	PTMTPA Multi-Source Impacts at Complex Terrain Receptors (μg/m³) [1,2]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	Recept. 1 - 30	Recept. 31-60	Recept. 61-90	Recept. 91-120	Recept. 121-150	Recept. 1 51	Max.	East (m)	North (m)		
1-hour average	81.1	113.3	100.0	53.3	61.1	8.9	113.3	758,261.3	4,615,647.5	2500	120
3-hour average	73.0	102.0	90.0	48.0	55.0	8.0	102.0	758,261.3	4,615,647.5	2500	120
8-hour average	56.8	79.3	70.0	37.3	42.8	6.2	79.3	758,261.3	4,615,647.5	2500	120
24-hour average	14.0	17.0	17.0	10.0	11.0	1.0	17.0	758,261.3	4,615,647.5	2500	120
Annual average	3.5	4.3	4.3	2.5	2.8	0.3	4.3	758,261.3	4,615,647.5	2500	120

Alternate receptor locations of maximum 24-hour and annual PTMTPA impacts, if applic.:	758,971.0	4,618,558.0	3320	60

	NO2 PSD Increment Analysis										
	PTMTPA Multi-Source Impacts at Complex Terrain Receptors (μg/m³) [1,2]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	Recept. 1 - 30	Recept. 31-60	Recept. 61-90	Recept. 91-120	Recept. 121-150	Recept. 1 51	Max.	East (m)	North (m)		
1-hour average	81.1	113.3	92.2	54.4	35.6	8.9	113.3	758,261.3	4,615,647.5	2500	120
3-hour average	73.0	102.0	83.0	49.0	32.0	8.0	102.0	758,261.3	4,615,647.5	2500	120
8-hour average	56.8	79.3	64.6	38.1	24.9	6.2	79.3	758,261.3	4,615,647.5	2500	120
24-hour average	14.0	17.0	14.0	10.0	8.0	1.0	17.0	758,261.3	4,615,647.5	2500	120
Annual average	3.5	4.3	3.5	2.5	2.0	0.3	4.3	758,261.3	4,615,647.5	2500	120

Alternate receptor locations of maximum 24-hour and annual PTMTPA impacts, if applic.:				

	SO2 AAQS Analysis										
	PTMTPA Multi-Source Impacts at Complex Terrain Receptors (μg/m³) [1,2]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	Recept. 1 - 30	Recept. 31-60	Recept. 61-90	Recept. 91-120	Recept. 121-150	Recept. 1 51	Max.	East (m)	North (m)		
1-hour average	48.9	83.3	146.7	86.7	104.4	3.3	146.7	758,261.3	4,615,647.5	2500	120
3-hour average	44.0	75.0	132.0	78.0	94.0	3.0	132.0	758,261.3	4,615,647.5	2500	120
8-hour average	34.2	58.3	102.7	60.7	73.1	2.3	102.7	758,261.3	4,615,647.5	2500	120
24-hour average	10.0	16.0	29.0	16.0	20.0	1.0	29.0	757,756.0	4,619,772.0	3319	30
Annual average	2.5	4.0	7.3	4.0	5.0	0.3	7.3	757,756.0	4,619,772.0	3319	30

Alternate receptor locations of maximum 24-hour and annual PTMTPA impacts, if applic.:				

	SO2 PSD Increment Analysis										
	PTMTPA Multi-Source Impacts at Complex Terrain Receptors ($\mu g/m^3$) [1,2]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	Recept. 1 - 30	Recept. 31-60	Recept. 61-90	Recept. 91-120	Recept. 121-150	Recept. 1 51	Max.	East (m)	North (m)		
1-hour average	36.7	51.1	41.1	23.3	13.3	3.3	51.1	758,261.3	4,615,647.5	2500	120
3-hour average	33.0	46.0	37.0	21.0	12.0	3.0	46.0	758,261.3	4,615,647.5	2500	120
8-hour average	25.7	35.8	28.8	16.3	9.3	2.3	35.8	758,261.3	4,615,647.5	2500	120
24-hour average	6.0	8.0	9.0	7.0	5.0	1.0	9.0	758,261.3	4,615,647.5	2500	120
Annual average	1.5	2.0	2.3	1.8	1.3	0.3	2.3	758,261.3	4,615,647.5	2500	120

Alternate receptor locations of maximum 24-hour and annual PTMTPA impacts, if applic.:				

	PM2.5 AAQS Analysis										
	PTMTPA Multi-Source Impacts at Complex Terrain Receptors ($\mu g/m^3$) [1,2]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	Recept. 1 - 30	Recept. 31-60	Recept. 61-90	Recept. 91-120	Recept. 121-150	Recept. 1 51	Max.	East (m)	North (m)		
1-hour average	40.7	56.6	46.2	27.0	18.1	4.6	56.6	758,261.3	4,615,647.5	2500	120
3-hour average	36.6	50.9	41.6	24.3	16.3	4.1	50.9	758,261.3	4,615,647.5	2500	120
8-hour average	28.5	39.6	32.4	18.9	12.7	3.2	39.6	758,261.3	4,615,647.5	2500	120
24-hour average	6.8	8.6	7.0	4.9	4.2	0.0	8.6	758,261.3	4,615,647.5	2500	120
Annual average	1.7	2.2	1.8	1.2	1.1	0.0	2.2	758,261.3	4,615,647.5	2500	120

Alternate receptor locations of maximum 24-hour and annual PTMTPA impacts, if applic.:				

	ISCST NO2 Impacts, Annual Average (µg/m^3)							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974	Max.	Max. Year	East (m)	North (m)		
PRE FBG Stack	1.04	**1.07**	0.94	1.00	0.87	1.07	1971	758,261.3	4,615,647.5	2500	120
PRE Emergency Generator	2.24	**2.28**	2.11	2.14	2.17	2.28	1971	756,121.1	4,616,770.5	129	169
Total PRE Sources	2.24	**2.28**	2.11	2.14	2.17	2.28	1971	756,121.1	4,616,770.5	129	169
Total Combined AAQS Sources	**3.32**	3.24	3.24	3.11	3.17	3.32	1970	746,361.0	4,613,354.0	10360	250
Total Combined PSD Sources	2.36	**2.42**	2.23	2.27	2.28	2.42	1971	756,121.1	4,616,770.5	129	169

	ISCST SO2 Impacts, Annual Average (µg/m^3)							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974	Max.	Max. Year	East (m)	North (m)		
PRE FBG Stack	0.49	**0.51**	0.44	0.47	0.41	0.51	1971	758,261.1	4,615,647.5	2500	120
PRE Emergency Generator	0.001	**0.001**	0.001	0.001	0.001	0.001	1971	756,121.1	4,616,770.5	129	169
Total PRE Sources	0.49	**0.51**	0.44	0.47	0.41	0.51	1971	758,261.3	4,615,647.5	2500	120
Total Combined AAQS Sources	**9.27**	9.04	9.10	8.73	9.20	9.27	1970	746,361.0	4,613,354.0	10360	250
Total Combined PSD Sources	**1.48**	1.39	1.32	1.31	1.28	1.48	1970	740,221.9	4,607,732.5	18330	240

	ISCST SO2 Impacts, 24-hr Average (µg/m^3)							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974	Max.	Max. Year	East (m)	North (m)		
PRE FBG Stack	2.91	2.62	**3.19**	3.04	2.36	3.19	1972	758,261.3	4,615,647.5	2500	120
PRE Emergency Generator	0.16	0.14	0.15	0.16	**0.18**	0.18	1974	756,015.1	4,616,892.0	81	266
Total PRE Sources	2.92	2.62	**3.19**	3.05	2.36	3.19	1972	758,261.3	4,615,647.5	2500	120
Total Combined AAQS Sources	53.18	59.00	**70.60**	56.84	49.06	70.60	1972	746,361.0	4,613,354.0	10360	250
Total Combined PSD Sources	7.50	**8.63**	8.11	8.20	7.94	8.63	1971	740,221.9	4,607,732.5	18330	240

	ISCST SO2 Impacts, 3-hr Average (µg/m³)					Max.	Max. Year	UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974			East (m)	North (m)		
PRE FBG Stack	9.77	9.96	9.68	9.48	**10.02**	10.02	1974	759,365.8	4,617,474.0	3320	80
PRE Emergency Generator	0.30	0.32	0.32	**0.34**	0.33	0.34	1973	755,996.1	4,616,849.5	111	244
Total PRE Sources	9.79	9.98	9.70	9.50	**10.03**	10.03	1974	759,365.8	4,617,474.0	3320	80
Total Combined AAQS Sources	165.40	157.52	152.29	**173.97**	167.01	173.97	1973	746,361.0	4,613,354.0	10360	250
Total Combined PSD Sources	35.73	34.00	34.53	35.59	**36.09**	36.09	1974	738,044.7	4,613,714.5	18330	260

	ISCST PM2.5 Impacts, Annual Average (µg/m³)					Max.	Max. Year	UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974			East (m)	North (m)		
PRE FBG Stack	0.51	**0.53**	0.46	0.49	0.43	0.53	1971	758,261.3	4,615,647.5	2500	120
PRE Emergency Generator	0.03	**0.03**	0.03	0.02	0.03	0.03	1971	756,121.1	4,616,770.5	129	169
PRE Cooling Tower	0.03	**0.03**	0.03	0.03	0.03	0.03	1971	756,140.8	4,616,794.5	112	157
Total PRE Sources	0.51	**0.53**	0.47	0.50	0.43	0.53	1971	758,261.3	4,615,647.5	2500	120
Total Combined AAQS Sources	0.51	**0.53**	0.47	0.50	0.43	0.53	1971	758,261.3	4,615,647.5	2500	120
Total Combined PSD Sources						0.00					

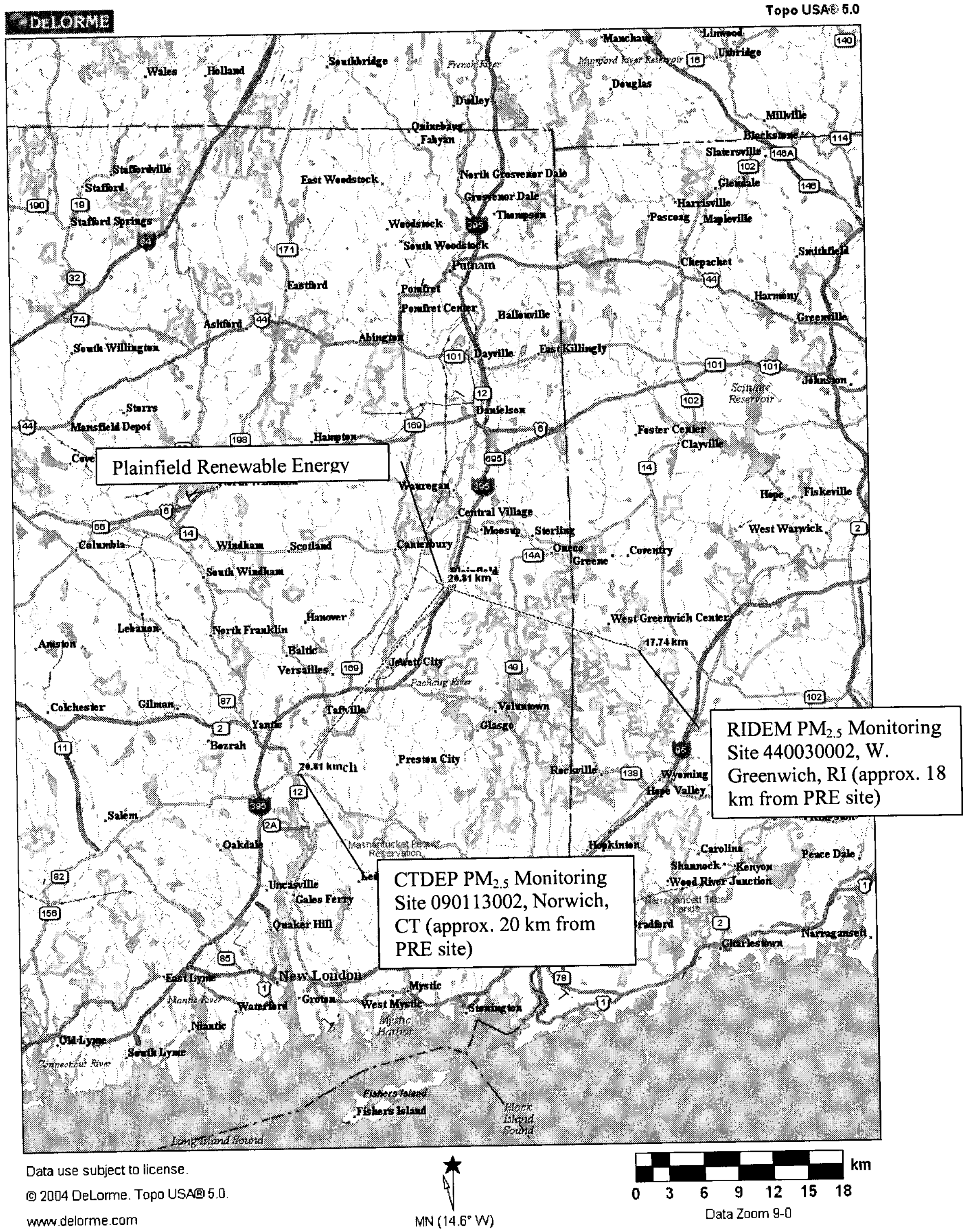
	ISCST PM2.5 Impacts, 24-hr Average (µg/m³)					Max.	Max. Year	UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974			East (m)	North (m)		
PRE FBG Stack	2.34	2.31	**2.69**	2.23	1.93	2.69	1972	758,261.3	4,615,647.5	2500	120
PRE Emergency Generator	3.02	3.13	3.18	**3.28**	3.26	3.28	1973	756,015.1	4,616,892.0	81	266
PRE Cooling Tower	0.21	0.21	**0.22**	0.21	0.21	0.22	1972	756,140.8	4,616,794.5	112	157
Total PRE Sources	3.14	3.27	3.25	**3.34**	3.32	3.34	1973	756,015.1	4,616,892.0	81	266
Total Combined AAQS Sources	3.14	3.27	3.25	**3.34**	3.32	3.34	1973	756,015.1	4,616,892.0	81	266
Total Combined PSD Sources						0.00					

Table 8 – List of Updated ISCST and PTMTPA Modeling Input and Output Files

Input Files:	Output Files:	Description
ISCST Prime Refined Multi-Source AAQS and PSD Increment Modeling Files:		
PREPAM70.PIN	PREPAM70.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1970
PREPAM71.PIN	PREPAM71.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1971
PREPAM72.PIN	PREPAM72.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1972
PREPAM73.PIN	PREPAM73.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1973
PREPAM74.PIN	PREPAM74.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1974
PREPMM70.PIN	PREPMM70.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1970
PREPMM71.PIN	PREPMM71.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1971
PREPMM72.PIN	PREPMM72.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1972
PREPMM73.PIN	PREPMM73.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1973
PREPMM74.PIN	PREPMM74.POU	Refined (w/ old site plan and emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1974
PREP7A70.PIN	PREP7A70.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1970
PREP7A71.PIN	PREP7A71.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1971
PREP7A72.PIN	PREP7A72.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1972
PREP7A73.PIN	PREP7A73.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1973
PREP7A74.PIN	PREP7A74.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1974
PREP7M70.PIN	PREP7M70.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1970
PREP7M71.PIN	PREP7M71.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1971
PREP7M72.PIN	PREP7M72.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1972
PREP7M73.PIN	PREP7M73.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1973
PREP7M74.PIN	PREP7M74.POU	Refined (w/ new site plan and old emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1974
PREP8A70.PIN	PREP8A70.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1970
PREP8A71.PIN	PREP8A71.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1971
PREP8A72.PIN	PREP8A72.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1972
PREP8A73.PIN	PREP8A73.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1973
PREP8A74.PIN	PREP8A74.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Annual AAQS + PSD Increment Multi-Source Anal. 1974

PREP8M70.PIN	PREP8M70.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1970
PREP8M71.PIN	PREP8M71.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1971
PREP8M72.PIN	PREP8M72.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1972
PREP8M73.PIN	PREP8M73.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1973
PREP8M74.PIN	PREP8M74.POU	Refined (w/ new site plan and new emission rates), Simple + Complex Terrain, PM, Short-Term AAQS + PSD Increment Multi-Source Anal. 1974
PTMTPA Complex Terrain Screening Modeling Files:		
PRE37R_IN.TXT	PRE37R_OU.TXT	Complex Terrain Screening Modeling (w/ old site plan and emission rates), PM2.5 AAQS, Receptors 1-30
PRE38R_IN.TXT	PRE38R_OU.TXT	Complex Terrain Screening Modeling (w/ old site plan and emission rates), PM2.5 AAQS, Receptors 31-60
PRE39R_IN.TXT	PRE39R_OU.TXT	Complex Terrain Screening Modeling (w/ old site plan and emission rates), PM2.5 AAQS, Receptors 61-90
PRE40R_IN.TXT	PRE40R_OU.TXT	Complex Terrain Screening Modeling (w/ old site plan and emission rates), PM2.5 AAQS, Receptors 91-120
PRE41R_IN.TXT	PRE41R_OU.TXT	Complex Terrain Screening Modeling (w/ old site plan and emission rates), PM2.5 AAQS, Receptors 121-150
PRE42R_IN.TXT	PRE42R_OU.TXT	Complex Terrain Screening Modeling (w/ old site plan and emission rates), PM2.5 AAQS, Receptor 151
PRE55_IN.TXT	PRE55_OU.TXT	Complex Terrain Screening Modeling (w/ new site plan and emission rates), PM2.5 AAQS, Receptors 1-30
PRE56_IN.TXT	PRE56_OU.TXT	Complex Terrain Screening Modeling (w/ new site plan and emission rates), PM2.5 AAQS, Receptors 31-60
PRE60_IN.TXT	PRE60_OU.TXT	Complex Terrain Screening Modeling (w/ new site plan and emission rates), PM2.5 AAQS, Receptors 61-90
PRE57_IN.TXT	PRE57_OU.TXT	Complex Terrain Screening Modeling (w/ new site plan and emission rates), PM2.5 AAQS, Receptors 91-120
PRE58_IN.TXT	PRE58_OU.TXT	Complex Terrain Screening Modeling (w/ new site plan and emission rates), PM2.5 AAQS, Receptors 121-150
PRE59_IN.TXT	PRE59_OU.TXT	Complex Terrain Screening Modeling (w/ new site plan and emission rates), PM2.5 AAQS, Receptor 151
BPIP Prime Files:		
PREP7M70.BPI	PREP7M70.PRO	BPIP Input and Output Files For ISCST Prime Refined Runs (w/ new site plan)

Figure 1 – Location of $PM_{2.5}$ Monitoring Sites Used to Represent Plainfield, CT



Attachment A

Revised Site Plan

Attachment B

Marked-Up Draft Air Permit

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

NEW SOURCE REVIEW PERMIT TO CONSTRUCT AND OPERATE A STATIONARY SOURCE

Issued pursuant to Title 22a of the Connecticut General Statutes (CGS) and Section 22a-174-3a of the Regulations of Connecticut State Agencies (RCSA).

Owner/Operator:	Plainfield Renewable Energy LLC
Address:	20 Marshall Street, Suite 300 Norwalk, CT 06854
Equipment Location:	Mill Brook Road, Plainfield, CT 06374
Equipment Description: power	37.5 MW (net) Biomass fluidized bed gasification power plant

Town-Permit Number:	149-0049
Premises Number:	abc
Permit Issue Date:	
Expiration Date:	

Comment [j1]: If this is not a revision/modification please delete this word

Gina McCarthy
Commissioner

Date

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

The conditions on all pages of this permit and attached appendices shall be verified at all times except those noted as design specifications. Design specifications need not be verified on a continuous basis; however, if requested by the commissioner, demonstration of compliance shall be shown.

PART I. OPERATIONAL CONDITIONS

A. Process Description

The power plant will use a fluidized bed staged gasification process with a close-coupled boiler to power the steam turbine generator. The biomass fuel will come from various sources which includes forest management residues, land clearing debris, waste wood from industries, construction and demolition (C&D) waste.

During startup bio-diesel (B100) is used to supplement the solid fuel supply.

B. Operating Limits

1. Fuel Type(s): Wood biomass[1], bio-diesel (B100)[2]
2. Maximum wood biomass Consumption over any Consecutive 12 Month Period: 495,305 tons/year based on a design higher heating value (HHV) of 4,624 Btu/lb

   The maximum wood biomass fuel consumption rate is based upon the maximum allowable heat input rate to the boiler of 523.1 MMBtu/hr. The actual consumption rate varies as a function of the actual fuel higher heating value.

3. Maximum bio-diesel (B100) consumption[3]: 781 gal/hr based on a design heating value of 128,047 Btu/gal
4. Maximum Fuel Sulfur Content (% by weight, dry basis): 1
5. Maximum Chlorine Content (% by weight, dry basis): 0.15

[1]Note: Biomass fuel shall consist of the following and may utilize 100% of any of the following fuels at any time:
[2]Note: Bio-diesel (B100) fuel shall be derived from 100% non-fossil fuels.
[3]Note: There is no annual restriction on the quantity of Bio-diesel (B100) that can be combusted in this unit.

FIRM NAME:
EQUIPMENT LOCATION:
EQUIPMENT DESCRIPTION (MODEL, I.D. #):

Town No: Premises No: Permit No: Stack No:

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF AIR MANAGEMENT

PART I. OPERATIONAL CONDITIONS, cont.

Biomass Wood	Description
Land Clearing debris	Chipped trees, stumps, branches or brush as defined in RCSA 22a-208a-1
Recycled wood or clean wood	Recycled wood means any wood or wood fuel which is derived from such products or processes as pallets skids, spools, packaging materials, bulky wood waste or scraps from newly built wood products, provided such wood is not treated wood. [CGS 22a-209a][RCSA 22a-208a-1]
Regulated wood fuel Processed Construction and Demolition wood	Regulated wood fuel means processed wood from construction and demolition activities which has been sorted to remove plastics, plaster, gypsum wallboard, asbestos, asphalt shingles and wood which contains creosote or to which pesticides have been applied or which contains substances defined as hazardous under section CGS 22a-115. [CGS 22a-209a]
Other Clean Wood	Other types if properly sized, clean, uncontaminated wood materials, such as sawdust, chips, bark, tree trimmings or other similar materials

6. The Permittee shall not cause or allow the bag house unit to operate at a temperature above the manufacturer's recommended design range for the bag material used. The filter media shall use acid resistant coatings.

7. Injection of ~~bed~~ additives (limestone, lime, dolomite or other materials), as determined during the initial performance test, into the bed material or dry scrubber shall be in sufficient quantities to maintain the SOx emissions rate in Part VI of this permit.

8. "Steady-state" operation shall be defined as operation of the fluid bed gasifier when the rate of change in load, with respect to time, is less than 5 percent per hour; except for such operation that occurs during periods of start-up, shutdown, fuel switching, and equipment cleaning. Additionally, steady-state operation shall include all modes of operation during which the fluid bed gasifier load exceeds 50% of the manufacturer's specified maximum ~~for this turbine~~.

9. "Transient" operation shall be defined as operation of the fluid bed gasifier when the rate of change in load, with respect to time, is ~~less than or~~ greater than ~~zero~~5 percent per hour. Additionally, transient operation shall include and describe the operation of the fluid bed gasifier during all phases of start-up, shutdown, fuel switching and equipment cleaning where the load is less than 50% of the manufacturer's specified maximum.

Comment [d2]: Bed should be deleted. Limestone/dolomite will be added to the bed and the lime will be injected into the dry scrubber.

Comment [d3]: Should be added to reflect actual emission controls.

Comment [d4]: 5 percent of what? Current load? MCR? What are the units of time? Per minute? Per hour?

Comment [d5]: Should equipment malfunction be included?

Comment [MIH6]: Should be greater than 5%?

FIRM NAME: ______
EQUIPMENT LOCATION: ______
EQUIPMENT DESCRIPTION (MODEL, I.D. #): ______

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

10. The "Administrator" means the Administrator of the United States Environmental Protection Agency. [RCSA 22a-174-1(3)]

11. The "Commissioner" means the Commissioner of the Environmental Protection Agency, or any member of the Department or any local air pollution control official or agency authorized by the commissioner, acting singly or jointly, to whom the commissioner assigns any function arising under the provisions of these regulations. [RCSA 22a-174-1(23)]

C. Design Specifications

Primary fuel
1. Maximum Fuel Firing Rate(s): 1,357 tons/day at a higher heating value (HHV) of 4,624 Btu/lb
2. Maximum Gross Heat Input (MMBTU/hr): 523.1
3. Maximum Steam Production (lbs/hr): 365,000
4. Maximum Electrical Generation (MW): 37.5 (net) nominal

Auxiliary fuel: B100
1. Maximum Fuel Firing Rate(s): 781 gal/hr at a ~~(HHV)~~ of 128,047 Btu/gal
2. Maximum Gross Heat Input (MMBTU/hr): 100

D. Stack Parameters

Primary fuel
1. Minimum Stack Height (ft): 155
2. Minimum Exhaust Gas Flow Rate at maximum load (acfm): 206,585 (biomass); 25,992 (B100)
3. Stack Exit Temperature (°F): 253
4. Minimum Distance from Stack to Property Line (ft): 69

E. Expected Control Efficiency

Type of control	Overall control efficiency	Pollutants Controlled
Selective Non-Catalytic Reduction (SNCR)	70%	NOx
Multicyclone	80%	PM
Spray Dryer	90% Efficiency includes bag house	SOx, HCL and metals
Baghouse	99% PM/PM-10/PM-2.5 (filterable); 90% SOx, HCL, and metals	PM/PM-10/PM-2.5 (filterable), SOx, HCL and metals

FIRM NAME:
EQUIPMENT LOCATION:
EQUIPMENT DESCRIPTION (MODEL, I.D. #):

Comment [j7]: this requirement will not be applicable once the TV permit is issued.

Comment [d8]: This value was based on an assumption of auxiliary power and steam turbine performance? It should be conservative, but will depend on the final design. Why is this necessary, since a Maximum heat input was specified at the beginning of the permit. Can the word Maximum be changed to Nominal?

Comment [MIH9R8]: We can ask for "nominal". Since this is listed as a "design specification", it is not required to be verified on a continuous basis - see top of p. 2.

Comment [j10]: Mike, found this number in the application: EPI supplied data

Comment [d11]: This will place a significant limit on the annual generation of the project! We were conservative when we selected the initial design parameters, so the net power output should always be above this value, even during the warmest months. During the coldest months the net generation should be significantly more. Why is this necessary, since a Maximum heat input was specified at the beginning of the permit. Can the word Maximum be changed to Nominal?

Comment [MIH12]: OK, as long as it is clear that emissions testing is only required in stack - control efficiency is not enforceable demonstration requirement.

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART II. CONTROL EQUIPMENT (Applicable if -X- Checked) (See Appendix E for Design Specifications)

A. Type

- ☐ None
- ☒ Scrubber: spray dryer
- ☐ Electrostatic Precipitator
- ☐ Cyclone
- ☒ Multi-Cyclone
- ☐ Thermal DeNOx
- ☒ Selective Non-Catalytic Reduction
- ☐ Selective Catalytic Reduction
- ☐ Low NOx Burner
- ☒ Fabric Filter: Bag House
- ☐ Particulate Trap
- ☐ Other

PART III. CONTINUOUS EMISSION MONITORING REQUIREMENTS AND ASSOCIATED EMISSION LIMITS (Applicable if -X- Checked)

CEM shall be required for the following pollutant/operational parameters and enforced on the following basis:

Pollutant/Operational Parameter	Averaging Times	Emission Limit	Units
☐ None			
☒ Opacity	1 hour block	10%	
☒ SOx	3 hour block	15.4	ppmvd @ 7% O_2
☒ NOx	24 hour block	45.3	ppmvd @ 7% O_2
☒ CO	8 hour block	103.7	ppmvd @ 7% O_2
☒ O_2	1 hour block		
☒ Ammonia	24 hour block	20	ppmvd @ 7% O_2
☒ Unit Load	4 hour block		steam flow
☒ Baghouse inlet temp.	24 hour block		
☒ Pressure drop across bag house	24 hour block		inches water

Comment [j13]: This is from 63.7500, table 2.2.b

Comment [j14]: as per J. Catalano, should be 3 hour block to comply with NAAQS

Comment [j15]: as per J. Catalano, should be 8 hour block to comply with NAAQS

The Permittee shall meet the performance and quality assurance specifications for the operation of CEM equipment pursuant to RCSA Section 22a-174-4.

(See Appendix A for General Requirements)

PART IV. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS

A. Monitoring

1. The Permittee shall use a non-resettable totalizing fuel metering device to continuously monitor bio-diesel fuel feed to this permitted source.

FIRM NAME: ______________________
EQUIPMENT LOCATION: ______________________
EQUIPMENT DESCRIPTION (MODEL, I.D. #): ______________________

Town No: Premises No: Permit No: Stack No:

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF AIR MANAGEMENT

PART IV. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS, cont.

B. Record Keeping

1. The Permittee shall keep records of daily and annual fuel consumption. Annual fuel consumption shall be based on any consecutive 12 month time period and shall be determined by adding (for each fuel) the current month's fuel usage to that of the previous 11 months. The Permittee shall make these calculations within 30 days of the end of the previous month.

Comment [j16]: this is required 40 CFR 60.49b(d)

2. The Permittee shall keep records of the fuel certification for each delivery of bio-diesel (B-100) fuel oil from the fuel supplier or a copy of the current contract with the fuel supplier supplying the fuel used by the equipment. The shipping receipt or contract shall include the date of delivery, the name of the fuel supplier and type of fuel delivered.

3. The Permitee shall keep records of the maintenance schedule for the bag house and record the bag failure rate.

4. The Permittee shall develop pollution control inspection procedures pursuant to the manufacturer's recommendations. The Permittee shall keep records of all inspections to pollution control devices. These records shall include the date of inspection, any findings of pollution control failures and the time period for corrective action.

5. The Permittee shall develop a written startup, shutdown and malfunction plan. [40 CFR Part 63.6(e)(3)]

Comment [j17]: required by MACT

6. The Permittee shall develop a site-specific monitoring plan. [40 CFR Part 63.7505(d)]

Comment [j18]: required by MACT

7. The Permittee shall record each and every exceedance of an emission limit or operating parameter contained in this permit. Such records shall include the date and time of the exceedance, a description of the exceedance, and the duration of the exceedance. Such report shall contain copies of the exceedance records for the month, an explanation of the likely causes of the exceedances, and an explanation of remedial actions taken to correct the exceedance.

8. The Permittee shall keep all records required by this permit for a period of no less than five years and shall submit such records to the commissioner upon request.

FIRM NAME: ______
EQUIPMENT LOCATION: ______
EQUIPMENT DESCRIPTION (MODEL, I.D. #): ______

Town No: Premises No: Permit No: Stack No:

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART IV. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS, cont.

C. Reporting

Comment [j19]: Not needed once TV permit is issued

1. Pursuant to 40 CFR Part 63 Subpart DDDDD, Table 9, the Permittee shall submit all required reports to the Administrator and duplicate reports to the Commissioner once a Title V operating permit is issued.

2. Permittee shall submit all required reports pursuant to 40 CFR Part 60 Subpart Db.(40 CFR 60.49b).

PART V. SPECIAL REQUIREMENTS FOR EMERGENCY ENGINES ONLY

Not applicable

PART VI. ALLOWABLE EMISSION LIMITS

For steady-state operation, the Permittee shall not cause or allow the emissions from this stationary source to exceed the emissions limits stated herein. An exceedance of any emission limit contained in Part VI of this permit is allowed only during periods of start-up, shut-down, and malfunction for a period of time not to exceed 3 hours for each occurrence.

Comment [j20]: this the same as the MWC [Sec. -38(c)(1)]

PART VI. ALLOWABLE EMISSION LIMITS, cont.

Primary Fuel: Biomass

Criteria Pollutants	lb/hr	lbs/MMBtu	Enforceable limits for pollutants monitored by CEMS (ppmvd @7% O_2)[a]	tpy
PM-10 (filterable)[b]	10.46	0.021		45.8~~2~~
PM-2.5 (filterable)[b]	10.46	0.021		45.8
PM-2.5 (condensable)[c]	8.89	0.017		39.0
PM-2.5 (Total)[c]	19.35	0.037		84.8
SOx	18.56	0.035[a]	15.4	81.29
NOx	39.23	0.075[a]	45.3	171.84
VOC	6.07	0.012		26.59
CO	54.67	0.105[a]	103.7	239.47
Pb	0.07	0.00014		0.32
Other Pollutants				
Total Selected Metals (TSM)		0.0003		
Hydrogen Chloride (HCL)		0.02		
Mercury		3.0E-6		
Ammonia			20	

Formatted: Superscript

Formatted: Superscript

Formatted: Superscript

Formatted: Superscript

Formatted: Superscript

Comment [MIH21]: Per 40 CFR 63.7500 and Table 1 to Subpart DDDDD, TSM is an alternative limit to the PM limit. A footnote should be added to clarify that the limits are alternatives.

Auxiliary Fuel: ~~B100[b]~~B100[d]				
PM-10	2.00			
SOx	0.17			
NOx	16.0			
VOC	0.27			
CO	4.0			

Note (a): Equivalent emission rate based on wood F-factor of 9,240 dscf/MMBtu. [40CFR Part 60, Appendix A, Table 19-2]

Note (b): Filterable particulate matter (PM-10 and PM-2.5) as measured by EPA Reference Method 5 or 17.

Note (c): Condensable PM-2.5 and total PM-2.5, including condensables, are estimated based on EPA AP-42 emission factor for condensable PM from wood residue, Table 1.6-1, Fifth Edition, September 2003 update. Demonstration of compliance with the PM-2.5 condensable emission limits shall be met by calculating the emission rates using the referenced AP-42 emission factor.

Note (~~b~~d): The use of B100 is not restricted to start-up operation. The B100 fuel can be fired in the auxiliary burners for initial/maintenance refractory curing and disposal beyond the typical 6-month shelf life.

FIRM NAME: ____________________
EQUIPMENT LOCATION: ____________________
EQUIPMENT DESCRIPTION (MODEL, I.D. #): ____________________

Town No: Premises No: Permit No: Stack No:

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART VI. ALLOWABLE EMISSION LIMITS, cont.

At all times the Permittee shall comply with the requirements of Section 22a-174-29 of the RCSA, entitled "Hazardous Air Pollutants". The Permittee shall demonstrate compliance for each and every hazardous air pollutant emitted from this unit that is listed on Table 29-1, Table 29-2, or Table 29-3 of Section 22a-174-29 of the RCSA.

Hazardous Air Pollutant[3]	**MASC* (μg/m³)**	**Hazardous Air Pollutant**	**MASC (μg/m³)**
Sulfuric Acid	3,656	Formaldehyde	2,193.6
Ammonia	65,808.7	Lead	548.4
Arsenic	9.1	Manganese	3,656
Beryllium	1.8	Mercury	182.8
Cadmium	73.1	Nickel	54.8
Chromium	457	2,3,7,8-TCDD equivalents**	1.3E-04
Copper	3,656		

***Maximum allowable stack concentration calculated based on maximum design exhaust gas flow rate of 214,655 acfm. For compliance purposes, actual stack concentrations must be compared to MASC values calculated based on exhaust gas volumes from performance testing.**

**** Dioxin emissions as defined in RCSA § 22a-174-1(29).**

Demonstration of compliance with the above emission limits shall be met by calculating the emission rates using emission factors from the following sources:

1. Manufacturer supplied data.
2. Maximum allowable emission rate pursuant to 40 CFR Part 63 Subpart DDDDD, Table 1
3. Hazardous Air Pollutant Emission Factors from AP-42 Tables 1.6-3 and 1.6-4, dated 09/03.

The above statement shall not preclude the commissioner from requiring other means (e.g. stack testing) to demonstrate compliance with the above emission limits, as allowed by state or federal statute, law or regulation.

PART VII. STACK EMISSION TEST REQUIREMENTS (Applicable if -X- Checked)

Stack emission testing shall be required for the following pollutant(s):

☐ None at this time

☒ PM[a] ☒ SOx ☒ NOx ☒ CO ☐ VOC ☒ Pb

☒ All hazardous air pollutants listed in Part VI of this permit

Note (a): Filterable particulate matter only, as measured by EPA Reference Method 5 or 17.

Comment [d22]: Where is this measured? Should a reference temperature be specified? This value may not be the maximum design exhaust gas flow rate.

Comment [MIH23R22]: This is the maximum flow at the stack, based on all cases evaluated in EPI's mass/flow balance. I think the footnote is ok as is. Ultimate compliance demonstration will be based on actual measured stack volume rate at time of performance test.

After the initial stack test, stack testing may not be required for pollutants requiring CEMs. The Department retains the right to require stack testing of any pollutant at any time to demonstrate compliance.

FIRM NAME: ______________________

EQUIPMENT LOCATION: ______________________

EQUIPMENT DESCRIPTION (MODEL, I.D. #): ______________________

Town No: Premises No: Permit No: Stack No:

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART VI. ALLOWABLE EMISSION LIMITS, cont.

All stack emissions tests shall be conducted in accordance with the requirements of Section 22a-174-5 of the RCSA. The Commissioner may attach additional requirements to the requirements of Section 22a-174-5 in order to demonstrate continual compliance with the requirements of this permit.

(See Appendix B for General Requirements)

PART VIII. APPLICABLE REGULATORY REFERENCES

RCSA §§22a-174-3a; 22a-174-4; 22a-174-7; 22a-174-18; 22a-174-19; 22a-174-22; 22a-174-29(b);

These references are not intended to be all inclusive - other sections of the regulations may apply.

PART IX. SPECIAL REQUIREMENTS

A. The Permittee shall possess, at least, 207 209.1 tons of external emissions reductions of NOx to offset the quantity of NOx emitted from this source to comply with RCSA Subsection 22a-174-3(1). Such a quantity is sufficient to offset the emissions from the sources listed at a ratio of 1.2 tons of reduction for every 1 ton of NOx emissions allowed under this permit. Such offsets shall have been obtained and approved by the Department prior to the date of issuance of the final construction/operating permit for this unit. The Permittee shall maintain sole ownership and possession of these emissions reductions for the duration of this permit and any subsequent changes to the permit.

Comment [j24]: need to verify the baseline to be used - is it just the boiler or premises wide NOx emissions???

Comment [MIH25]: Total premise NOX including boiler and diesel generator is 174.25 TPY. 209.1 TPY offsets would be required at 1.2:1 ratio.

B. The Permittee shall operate and maintain this equipment in accordance with the manufacturer's specifications and written recommendations. Appropriate records shall be made to verify that there is proper operation, monitoring and maintenance of all pollution control devices.

C. The Permittee shall operate pollution control devices at all times during normal operation. Additionally, transient operation shall include and describe the operation of the plant during all phases of start-up, shutdown, fuel switching and equipment cleaning where the fluidized bed gasifier load is less than 50% of the manufacturer's specified maximum. During such times of transient operation pollution control devices shall be operated according to the manufacturers recommendations. The bag house can be operated in a by-pass mode during start-up/shut-down to avoid acid gas condensation on the filter media. The operation of the plant during start-up shall not exceed three (3) hours for each occurrence.

D. The Permittee shall comply with all applicable requirements of Section 22a-174-6 of the RCSA, entitled "Air Pollution Emergency Episode Procedures".

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART IX. SPECIAL REQUIREMENTS, cont.

E. *Noise (for non-emergency use)*

The Permittee shall operate this facility at all times in a manner so as not to violate or contribute significantly to the violation of any applicable state noise control regulations, as set forth in RCSA Sections 22a-69-1 through 22a-69-7.4.

F. The Permittee shall comply with all applicable sections of the following New Source Performance Standard(s) at all times. (Applicable if -X- checked)

40 CFR Part 60, Subpart: ☒ Db ☐ Dc ☐ GG ☒ A

☐ None

(See Appendix C for Detailed Requirements)

G. The Permittee shall comply with all applicable sections of the following National Emission Standards for Hazardous Air Pollutants at all times. (Applicable if -X- checked)

40 CFR Part 63, Subpart: ☒ DDDDD ☒ A

Comment [MIH26]: Note, Per 40 CFR 63.7500 and Table 2 to Subpart DDDDD, opacity monitoring is an acceptable alternative to a bag leak detection system for a baghouse with dry control systems. Per the definitions, spray dryer is considered a dry control system. Therefore, opacity monitoring should be acceptable.

H. Unless directed otherwise by the Commissioner, if the proposed facility is not constructed within eighteen (18) months from the date of issuance of this permit, the Permittee shall be required to re-certify and conduct further BACT analysis.

PART X. ADDITIONAL TERMS AND CONDITIONS

A. This permit does not relieve the Permittee of the responsibility to conduct, maintain and operate the regulated activity in compliance with all applicable requirements of any federal, municipal or other state agency. Nothing in this permit shall relieve the Permittee of other obligations under applicable federal, state and local law.

B. Any representative of the DEP may enter the Permittee's site in accordance with constitutional limitations at all reasonable times without prior notice, for the purposes of inspecting, monitoring and enforcing the terms and conditions of this permit and applicable state law.

C. This permit may be revoked, suspended, modified or transferred in accordance with applicable law.

FIRM NAME: __________
EQUIPMENT LOCATION: __________
EQUIPMENT DESCRIPTION (MODEL, I.D. #): __________

Town No: Premises No: Permit No: Stack No:

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART X. ADDITIONAL TERMS AND CONDITIONS, cont.

D. This permit is subject to and in no way derogates from any present or future property rights or other rights or powers of the State of Connecticut and conveys no property rights in real estate or material, nor any exclusive privileges, and is further subject to any and all public and private rights and to any federal, state or local laws or regulations pertinent to the facility or regulated activity affected thereby. This permit shall neither create nor affect any rights of persons or municipalities who are not parties to this permit.

E. Any document, including any notice, which is required to be submitted to the commissioner under this permit shall be signed by a duly authorized representative of the Permittee and by the person who is responsible for actually preparing such document, each of whom shall certify in writing as follows: "I have personally examined and am familiar with the information submitted in this document and all attachments thereto, and I certify that based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement made in the submitted information may be punishable as a criminal offense under section 22a-175 of the Connecticut General Statutes, under section 53a-157b of the Connecticut General Statutes, and in accordance with any applicable statute."

F. Nothing in this permit shall affect the commissioner's authority to institute any proceeding or take any other action to prevent or abate violations of law, prevent or abate pollution, recover costs and natural resource damages, and to impose penalties for violations of law, including but not limited to violations of this or any other permit issued to the Permittee by the commissioner.

G. Within 15 days of the date the Permittee becomes aware of a change in any information submitted to the commissioner under this permit, or that any such information was inaccurate or misleading or that any relevant information was omitted, the Permittee shall submit the correct or omitted information to the commissioner.

FIRM NAME: ______
EQUIPMENT LOCATION: ______
EQUIPMENT DESCRIPTION (MODEL, I.D. #): ______

Town No: Premises No: Permit No: Stack No:

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

PART X. ADDITIONAL TERMS AND CONDITIONS, continued:

H. The date of submission to the commissioner of any document required by this permit shall be the date such document is received by the commissioner. The date of any notice by the commissioner under this permit, including but not limited to notice of approval or disapproval of any document or other action, shall be the date such notice is personally delivered or the date three days after it is mailed by the commissioner, whichever is earlier. Except as otherwise specified in this permit, the word "day" means calendar day. Any document or action which is required by this permit to be submitted or performed by a date which falls on a Saturday, Sunday or legal holiday shall be submitted or performed by the next business day thereafter.

I. Any document required to be submitted to the commissioner under this permit shall, unless otherwise specified in writing by the commissioner, be directed to: Office of Director; Engineering & Enforcement Division; Bureau of Air Management; Department of Environmental Protection; 79 Elm Street, 5th Floor; Hartford, Connecticut 06106-5127.

FIRM NAME: ______________________________
EQUIPMENT LOCATION: ______________________________
EQUIPMENT DESCRIPTION (MODEL, I.D. #): ______________________________

Town No: Premises No: Permit No: Stack No:

PERMIT FOR FUEL BURNING EQUIPMENT

STATE OF CONNECTICUT, DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR MANAGEMENT

Appendices attached (Applicable if -X- checked):

☒ A Continuous Emission Monitoring Requirements

☒ B Stack Emission Test Requirements

☒ C New Source Performance Standards

☒ E Control Equipment Design Specifications

Town No: Premises No: Permit No: Stack No:

APPENDIX E
Control Equipment Design Specifications

Air Pollution Control Equipment (applicable if -X- checked).

The following specifications need not be verified on a continuous basis, however, if requested by the Bureau, demonstration shall be shown.

☐ None

☒ Scrubber

Make and Model: Wheelabrator, McGill, Research-Cottrell or equivalent
Reagent: Hydrated Lime [$Ca(OH)_2$]
Reagent Flow Rate: 400-700 lb/hr
Pressure Drop (inches H_2O): <3.0
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): 222,110~~119,198~~

PH:
Design Outlet Grain Loading (gr/dscf): 1.5-2.5 (estimated, depending on multicyclone performance and lime usage)
Design Removal Efficiency (%) : 90% SOx

☐ Electrostatic Precipitator (ESP)

Make and Model:
Number of Fields:
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm):
Design Outlet Grain Loading (gr/dscf):
Design Removal Efficiency (%):

☐ Cyclone ☒ Multicyclone

Make and Model: Barron Industries or equivalent
Pressure Drop (inches H_2O): <3
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): ~~119,198~~348,019

☒ Selective Non-catalytic Reduction (SNCR)

☒ Urea ☐ Ammonia

Make and Model: Energy Products of Idaho (EPI)
Injection Rate at Maximum Rated Capacity (lb/hr): 700-850 @ 32.5% urea solution
Operating Temperature Range (°F): 1600-1800°F (typical)
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): ~~119,198~~636,000

Design Removal Efficiency (%): 70% (max)

☐ Selective Catalytic Reduction (SCR)

Make and Model:
Catalyst Type:
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm):
Pressure Drop (in H_2O):
Ammonia Injection Rate at Maximum Rated Capacity (lb/hr):
Design Removal Efficiency (%):

Comment [d27]: This is what EPI predicted based on a very basic design effort. Depending on the final design this value may not be the minimum. What is the purpose of specifying this value? At what temperature?

Comment [MIH28R27]: These are design specifications, not subject to continuous verification. However, given the preliminary nature of these values, I would recommend a footnote stating that and possibly agreeing to update the values upon completion of detailed engineering. Do you have any suggested wording?

Comment [MIH29]: 119,198 is DSCFM. ACFM value at spray dryer inlet (see EPI specs.)

Comment [MIH30]: ACRM at multiclone inlet - EPI specs.

Comment [d31]: This is what EPI predicted based on a very basic design effort. Depending on the final design this value may not be the minimum. What is the purpose of specifying this value? At what temperature?

Comment [MIH32]: ACFM within boiler - EPI specs.

Comment [d33]: This is what EPI predicted based on a very basic design effort. Depending on the final design this value may not be the minimum. What is the purpose of specifying this value? At what temperature?

Town No: Premises No: Permit No: Stack No:

APPENDIX E
Control Equipment Design Specifications

☐ Low NOx Burner

Make and Model: ____
Guaranteed NOx Emission Rate (lb/MM BTU): ____
Design Removal Efficiency (%): ____

☐ Particulate Trap

Make and Model: ____
Design Removal Efficiency (%): ____

☒ Fabric Filter

Make and Model: McGill, Aeropulse, Wheelabrator or equivalent
Number of Bags in Use: TBD
Bag Material: P-84 felt or equivalent
Air/Cloth Ratio: <3.5:1
Net Cloth Area (ft^2): TBD
Cleaning Method: Pulse Jet
Pressure Drop (inches H_2O): 8
Minimum Gas Flow Rate at Maximum Rated Capacity (acfm): ~~119,198~~204,507
Design Outlet Grain Loading (gr/dscf): 0.01 (filterable catch)
Design Removal Efficiency (%): 99.9

☐ Other: ____

Comment [MIH34]: ACFM in baghouse - EPI specs.

Comment [d35]: This is what EPI predicted based on a very basic design effort. Depending on the final design this value may not be the minimum. What is the purpose of specifying this value? At what temperature?

Town No: Premises No: Permit No: Stack No:

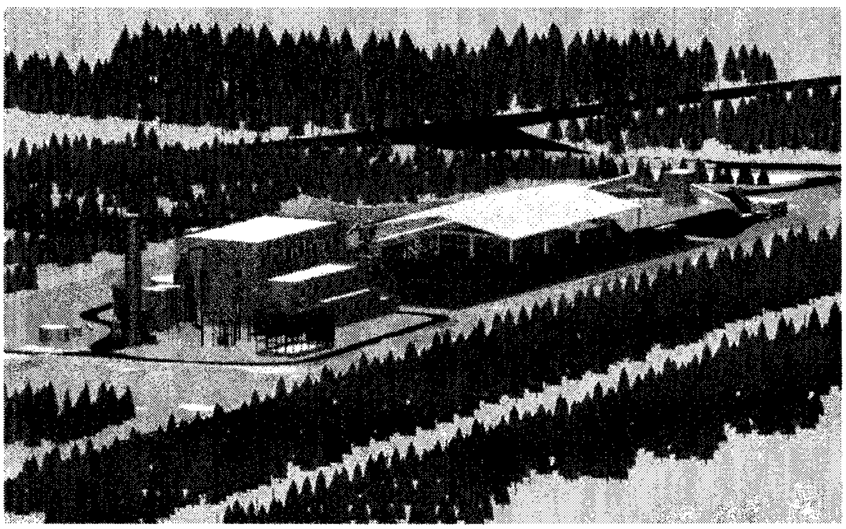
Attachment G

M.I. HOLZMAN
& ASSOCIATES, LLC

Environmental Engineering ■ Impact Assessment ■ Compliance Services

AIR QUALITY IMPACT ANALYSIS

PLAINFIELD RENEWABLE ENERGY PROJECT
Mill Brook Road
Plainfield, CT



In Support of:
CTDEP Application No. 200602226
For Air Permit to Construct and Operate

Prepared For:
Plainfield Renewable Energy LLC
20 Marshall Street, Suite 300
Norwalk, CT 06854
www.prellc.net

Prepared By:
M.I. Holzman & Associates, LLC

December 2006

57 Mountain View Drive
West Hartford, CT 06117-3028

Phone: 860-523-8345
Fax: 860-523-8394
Mholzman2@comcast.net

EXECUTIVE SUMMARY

Ambient air quality impact analyses were performed in support of the air permit application by Plainfield Renewable Energy LLC to construct and operate a biomass-fueled fluidized bed staged gasifier power plant in Plainfield, CT. Based on potential emissions, the Project is subject to Prevention of Significant Deterioration review requirements for PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO and VOC. Therefore, in addition to a demonstration of compliance with Ambient Air Quality Standards and applicable PSD Increments, additional impact analyses were performed to evaluate the impacts of facility emissions on visibility, on soils and vegetation, and to evaluate the potential for impacts due to secondary growth.

All modeling analyses were performed in accordance with procedures specified in the CTDEP Ambient Impact Analysis Guideline or otherwise recommended by CTDEP. The results of the air quality impact analyses demonstrate that ambient impacts resulting from facility potential emissions will comply with all applicable Ambient Air Quality Standards and PSD Increments and will not impair visibility or significantly impact soils and sensitive vegetation. In addition, no significant additional emissions or air quality impacts from secondary growth are anticipated due to construction or operation of the PRE project.

ABBREVIATIONS

AQCR	Air Quality Control Region
AQRV	Air Quality Related Value
AAQS	Ambient Air Quality Standards
AQIA	Air Quality Impact Analysis
CAAQS	CT Ambient Air Quality Standards
CO	Carbon monoxide
CO_2	Carbon dioxide
C&D	Construction and demolition debris
CTDEP	CT Department of Environmental Protection
EPI	Energy Products of Idaho, Inc.
FBG	Fluidized bed gasifier or fluidized bed gasification
GEP	Good Engineering Practice
lb/hr	Pounds per hour
lb/MMBtu	Pounds per million British Thermal Units
MADEP	Massachusetts Department of Environmental Protection
MASC	Maximum Allowable Stack Concentration
NAAQS	National Ambient Air Quality Standards
NNSR	Nonattainment New Source Review
NO_X	Nitrogen oxides
NO	Nitric oxide
NO_2	Nitrogen dioxide
NSR	New Source Review
PM	Particulate matter
PM_{10}	Particulate matter less than 10 microns
$PM_{2.5}$	Fine particulate matter – less than 2.5 microns
ppmv	Parts per million by volume (uncorrected, wet conditions)
PRE	Plainfield Renewable Energy LLC (the "Applicant")
PSD	Prevention of Significant Deterioration
RCSA	Regulations of Connecticut State Agencies
RIDEM	Rhode Island Department of Environmental Management
SIL	Significant Impact Level
SO_2	Sulfur dioxide
SO_X	Sulfur oxides
TPY	Tons per year
VOC	Volatile organic compounds

TABLE OF CONTENTS

Executive Summary ... i
Abbreviations ... ii
Table Of Contents ... iii
1.0 Introduction ... 1
1.1 Project Description ... 1
1.2 Proposed Potential Emissions and Regulatory Requirements ... 4
1.3 Ambient Impact Analysis Requirements ... 5
1.3.1 CTDEP Ambient Impact Analysis Requirements ... 5
1.3.2 PSD Ambient Impact Analysis Requirements ... 5
1.4 Summary of Modeling Analysis Objectives ... 7
2.0 Model Inputs and Preliminary Analyses ... 8
2.1 PRE Sources, Emissions and Stack Parameters ... 8
2.2 Good Engineering Practice (GEP) Stack Height Analysis ... 11
2.3 Cavity Zone Impact Analysis ... 11
2.4 Urban/Rural Designation ... 21
3.0 Screening Modeling Analysis ... 24
4.0 Refined Single-Source Modeling Analysis ... 28
4.1 Models Used ... 28
4.2 Stack Parameters ... 28
4.3 Building Downwash – BPIP Model ... 28
4.4 Receptor Network and Terrain Elevations ... 28
4.5 Meteorological Data ... 32
4.6 Background Air Quality ... 32
4.7 Other Modeling Options ... 37
4.8 Modeling Results and Determination of Significant Impact Area ... 37
4.9 Pre-Construction Monitoring Waiver Request ... 43
5.0 Refined Multiple-Source Cummulative Modeling Analysis ... 44
5.1 Emissions and Stack Parameters – PRE Sources ... 44
5.2 Emissions and Stack Parameters – Interactive Sources ... 44
5.3 Building Downwash – BPIP ... 53
5.4 Receptor Network/Terrain Elevations ... 53
5.5 Meteorological Data ... 54
5.6 Other Modeling Options ... 54
5.7 Background Air Quality ... 54
5.8 Multiple-Source Modeling Results ... 54
6.0 Additional Impact Analyses ... 59
6.1 Visibility Impairment Analysis ... 59
6.2 Soils and Vegetation Analysis ... 61
6.3 Growth Analysis ... 62
7.0 Summary and Conclusions ... 64
8.0 References ... 66

Tables

Table 1-1 – Proposed Potential Emissions 4
Table 1-2 – National and CT Ambient Air Quality Standards and Significant Impact Levels 6
Table 1-3 – Allowable PSD Increments ($\mu g/m^3$) 6
Table 2-1 – Screening Modeling Analysis Input Data – FBG Stack 9
Table 2-2 – Stack Parameters for PRE Emergency Generator and Cooling Tower 10
Table 2-3 – Dimensional Data For GEP Stack Height and Cavity Impact Analysis 12
Table 2-4 – Preliminary GEP Stack Height Analysis – FBG Stack 13
Table 2-5 – Preliminary GEP Stack Height Analysis – Emergency Generator Stack 14
Table 2-6 – Preliminary GEP Stack Height Analysis – Cooling Tower 15
Table 2-7 – Cavity Region Analysis – FBG Stack 16
Table 2-8 – Cavity Region Analysis – Emergency Generator Stack 17
Table 2-9 – Cavity Region Analysis – Cooling Tower 19
Table 3-1 – Summary of Terrain Data For Screening Modeling 25
Table 3-2 – ISCST Screening Modeling Results 26
Table 4-1 – Refined Single-Source Modeling Analysis Input Data 29
Table 4-2 – PTMTPA Complex Terrain Receptors (Elevation Greater Than Stack Top) 35
Table 4-3 – Representative Ambient Background Concentrations 36
Table 4-4 – ISCST and PTMTPA Single-Source Normalized (1 g/sec) Impacts 38
Table 4-5 – ISCST and PTMTPA Refined Single-Source Modeling Results 41
Table 5-1 – Refined Multiple-Source Analysis Input Data for PRE Sources 45
Table 5-2 - Modeling Input for Refined Multiple-Source NO_2 AAQS Impact Analysis 47
Table 5-3 - Modeling Input for Refined Multiple-Source SO_2 AAQS Impact Analysis 48
Table 5-4 - Modeling Input for Refined Multiple-Source $PM_{2.5}$ AAQS Impact Analysis* 49
Table 5-5 - Modeling Input for Refined Multiple-Source NO_2 PSD Increment Analysis 50
Table 5-6 - Modeling Input for Refined Multiple-Source SO_2 PSD Increment Analysis 51
Table 5-7 – Source Groups Used in ISCST-PRIME Multiple-Source Analyses 52
Table 5-8 – Refined Multiple-Source ISCST and PTMTPA Modeling Results 55
Table 5-9 – Summary of Maximum Multiple-Source Impacts 57
Table 6-1 – VISCREEN Model Input Data 60
Table 6-2 – VISCREEN Level-1 Analysis Results 60
Table 6-3 – Comparison of PRE Impacts to AQRVs, PSD Increments and AAQS 62
Table 7-1 – Summary of AAQS Analysis Results 65
Table 7-2 – Summary of PSD Increment Consumption Analysis Results 65

Figures

Figure 1-1 – USGS Site Location Map 2
Figure 1-2 – EPI Fluidized Bed Gasifier Process Flow and Conceptual Arrangement Diagram... 3
Figure 2-1 – USGS Topographic Map Showing 3 KM Radius Land Use 22
Figure 2-2 – 3 KM Radius Aerial Photograph 23
Figure 4-1 – BPIP Model Setup, Building/Structure Identification 30
Figure 4-2 – BPIP Model Setup, 3D Building Representation 31
Figure 4-3 – Computer-Generated Conceptual Rendering 31

Figure 4-4 – ISCST Model Setup, Showing Buildings, Fenceline, Plant Boundary and Near-Field Receptors 33
Figure 4-5 – ISCST Model Setup, Polar Receptors and Domain Boundaries 34

Appendices

A Site Plan, General Arrangement Plans and Conceptual Renderings
B BPIP with PRIME Algorithm Model Output
C CTDEP Inventory Radius Search Data Files
D PTMTPA and ISCST Multiple-Source Modeling Results Summaries
E List of ISCST, PTMTPA and BPIP Model Run Input and Output Files
F VISCREEN Model Output files

1.0 INTRODUCTION

This report summarizes the air quality impact analysis performed on behalf of Plainfield Renewable Energy LLC (PRE) in support of its August 9, 2006 application for a New Source Review Permit to Construct and Operate a biomass-fueled fluidized bed staged gasification (FBG) power plant to be located in Plainfield, CT. Based on estimated potential emissions from the proposed premise, the Project will be a Major Stationary Source subject to Prevention of Significant Deterioration (PSD) review, including requirements to perform an air quality impact analysis to demonstrate compliance with National and CT Ambient Air Quality Standards (NAAQS/CAAQS) and Allowable PSD Increments. This report summarizes the scope, procedures and results of the screening and refined dispersion modeling analyses, which were performed in accordance with the CTDEP's Ambient Impact Analysis Guideline (AIAG)[1] and other guidance provided by CTDEP.

1.1 Project Description

PRE is a joint venture between Decker Energy International, Inc., and NuPower LLC, dedicated to developing Connecticut's first renewable biomass energy project. The PRE project will produce renewable power from biomass fuels, which will result in conservation of limited fossil fuels and lower pollutant emissions than existing fossil fuel fired power plants, among other benefits.

The Connecticut Clean Energy Fund, created by the Connecticut General Assembly, promotes the development of clean energy throughout the state. The Clean Energy Fund has selected PRE to meet their progressive goals for generating clean energy, and has committed significant development funding to insure its success.

The PRE project will be a 37.5 MW (net) biomass energy facility at a site located on Mill Brook Road in Plainfield, CT. The Project will be located on 27 acres of industrial-zoned land in Plainfield, bounded by Mill Brook Road and State Route 12. Previously a Superfund location, this site has been fully cleaned and remediated and will significantly contribute to Plainfield's tax base with development of the Project. A USGS site location topographic map is provided as Figure 1-1. The PRE project will be located in the Eastern Connecticut Air Quality Control Region (AQCR 41).

The proposed PRE power plant will use an advanced fluidized bed staged gasification (FBG) process to produce a gas stream derived from biomass to generate steam to drive a conventional steam turbine generator. Fluidized bed staged gasification of solid fuels will result in inherently lower air pollutant emissions than alternative grate or spreader-stoker type combustion systems. In addition, the PRE facility will employ state-of-the-art air pollution control systems, including selective non-catalytic reduction (SNCR) for control of nitrogen oxides (NO_X); a spray dryer scrubber for control of sulfur oxides (SO_X), acid gases and metals emissions; and a fabric filter (baghouse) for particulate matter (PM) emissions control. A process flow diagram showing the conceptual arrangement of the fluidized bed gasifier, boiler and flue gas controls is provided in Figure 1-2.

Figure 1-1 – USGS Site Location Map

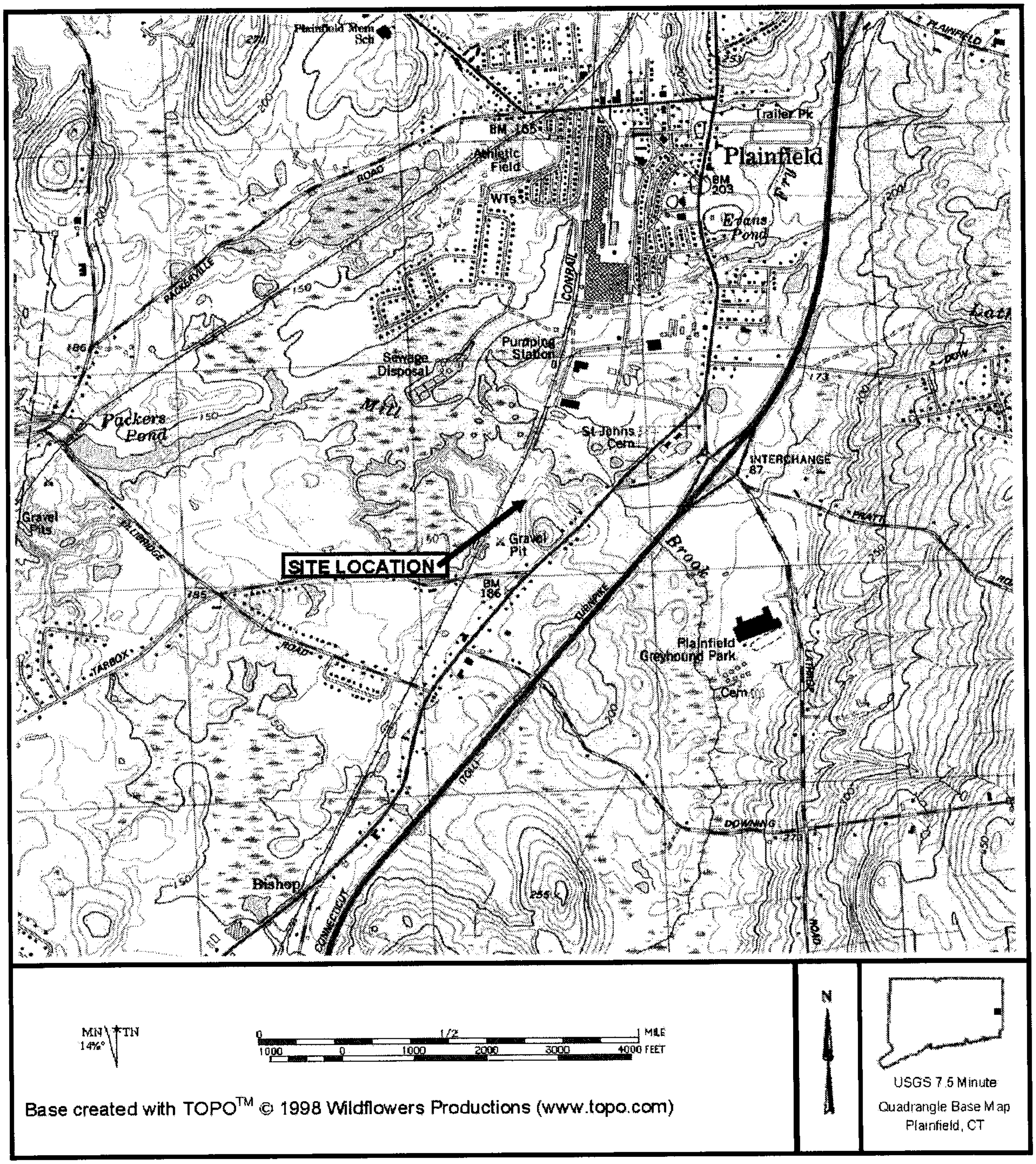
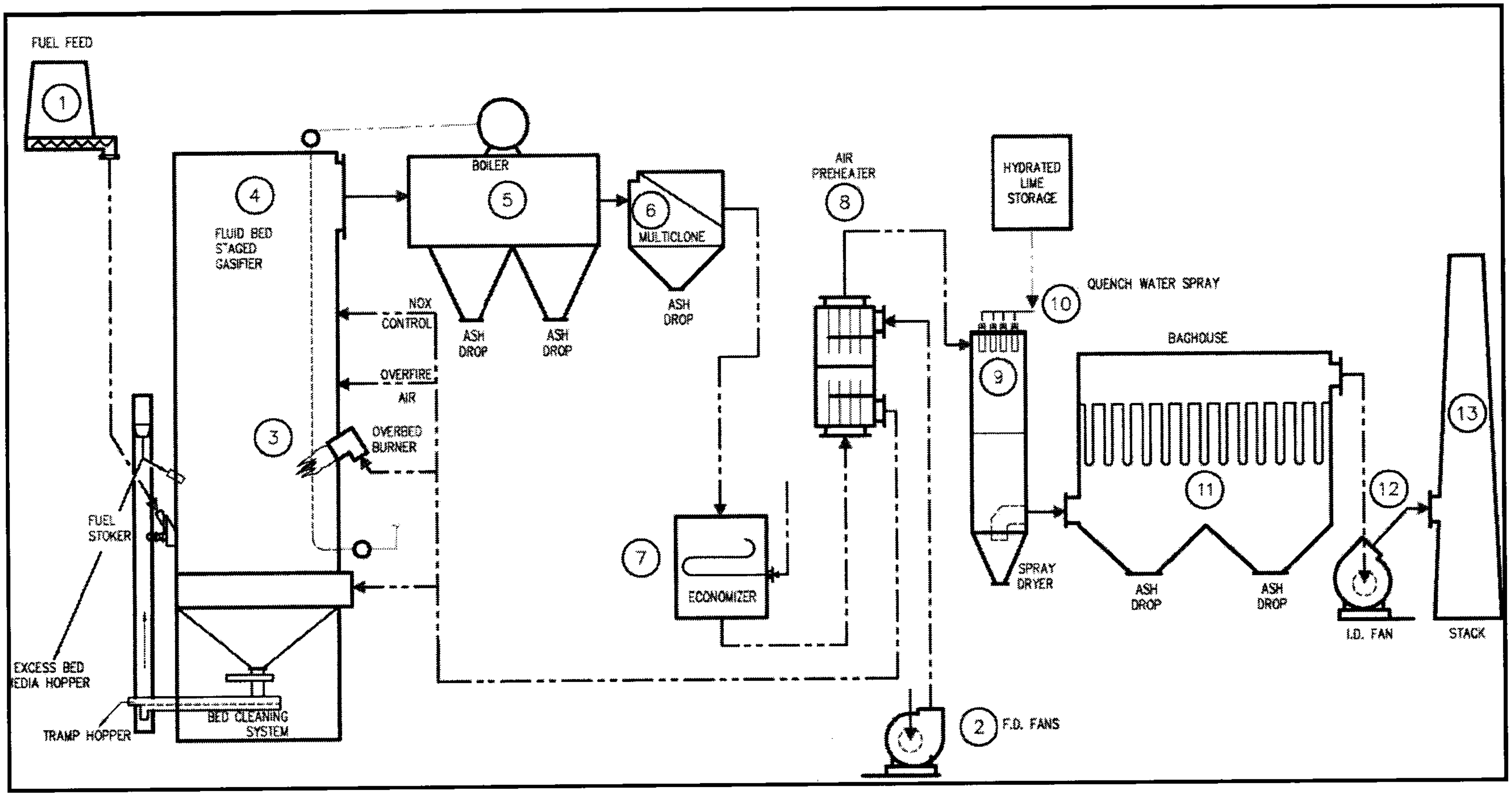


Figure 1-2 – EPI Fluidized Bed Gasifier Process Flow and Conceptual Arrangement Diagram



The facility will accept and gasify biomass fuels from a range of sources, including: forest management residues, landclearing debris and waste wood from municipalities and other industries. In addition, the facility will accept and gasify wood derived from the processing of construction and demolition (C&D) debris obtained from regulated offsite fuel processing facilities adhering to strict specifications (size, quality, etc.).

Other ancillary emissions sources at the PRE biomass energy facility will include a wet cooling tower and a stationary internal combustion engine used to power an emergency generator. The wet cooling tower is estimated to have the potential to emit less than 15 TPY PM_{10} and $PM_{2.5}$ and will, therefore, not trigger CTDEP permit requirements. As currently planned, the emergency generator will be powered by a diesel engine. The emergency engine will be operated in accordance with CTDEP permit exemption criteria pursuant to RCSA § 22a-174-3b(e) and will, therefore, not require an individual air permit.

1.2 Proposed Potential Emissions and Regulatory Requirements

Emission calculations representing the range of expected operating conditions were provided in Attachment E to the Air Permit Application along with the assumptions and bases of the calculations. The proposed controlled potential emissions of regulated pollutants are summarized in Table 1-1.

Table 1-1 – Proposed Potential Emissions

Pollutant[1]	Biomass FBG Controlled Potential Emissions (TPY)	Diesel Engine Emergency Generator (TPY)	Cooling Tower (TPY)	Total Premise Controlled Potential Emissions (TPY)	CTDEP Major Stationary Source Threshold (TPY)	PSD Significant Emission Rate (TPY)
PM/PM_{10}	45.82	0.07	0.65	46.55	100	25/15
$PM_{2.5}$[2]	45.82	0.07	0.65	46.55	100[2]	10[2]
NO_X	171.84	2.41		174.25	50[3]	40
SO_X	81.29	0.0012		81.29	100	40
CO	239.47	0.55		240.02	100	100
VOC	26.59	0.07		26.66	50[3]	25
Pb	0.32	7.0E-06		0.32	10	0.6
H_2SO_4	6.50			6.50	100	7
Hg	0.006			0.006	100	0.1
Dioxins[4]	2.0E-07			2.0E-07	10	3.5E-06

1 Other regulated pollutants potentially subject to PSD review are estimated to be less than applicable Significant Emission Rate (see permit application, Attachment E, submitted August 9, 2006).

2 $PM_{2.5}$ emissions conservatively assumed to be equal to PM_{10} emissions. Major Source threshold and PSD Significant Emission Rate based on EPA "Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standards", Federal Register/Vol. 70, No. 210/ November 1, 2005

3 CTDEP Nonattainment New Source Review/Major Stationary Source Thresholds based on location of proposed facility in serious ozone nonattainment area.

4 Dioxins emissions expressed in terms of 2,3,7,8 dibenzo-p-dioxin equivalents, as defined in RCSA § 22a-174-1. PSD Significant Emission Rate expressed in terms of total tetra-through octa-chlorinated dibenzo-p-dioxins and furans.

Based on the attainment status of the Plainfield area (AQCR 41 is currently classified as serious nonattainment for ozone, attainment or unclassified for all other criteria pollutants) and the estimated potential emission levels summarized in Table 1-1, the proposed PRE project will be considered a Major Stationary Source with respect to the PSD regulations and will be subject to PSD review for all criteria pollutants with the exception of lead. The following subsections describe the specific CTDEP and PSD ambient impact analysis requirements applicable to the PRE facility.

PRE will also be subject to Nonattainment New Source Review (NNSR) due to potential emissions of ozone precursor NO_X emissions, which will exceed 50 TPY in a serious ozone nonattainment area. Demonstration of compliance with NNSR requirements, including a Lowest Achievable Emission Rate (LAER) analysis for NO_X, emissions offset requirements and an alternatives analysis, were included in the air permit application submitted to CTDEP on August 9, 2006. Demonstrations of compliance with additional EPA and CTDEP emission standards, permit and other requirements applicable to the project were also included in the permit application.

1.3 Ambient Impact Analysis Requirements

1.3.1 CTDEP Ambient Impact Analysis Requirements

Pursuant to Regulations of Connecticut State Agencies (RCSA) § 22a-174-3a(d), a CTDEP permit to construct and operate a stationary source shall not be issued unless the applicant demonstrates, among other requirements, that the proposed stationary source or modification can be operated without preventing or interfering with the attainment or maintenance of any applicable ambient air quality standards (AAQS) or any PSD Increments. The CTDEP AAQS, which are the same as the National Ambient Air Quality Standards (NAAQS) are summarized in Table 1-2 along with EPA-defined Significant Impact Levels (SILs). PSD Increments are summarized in Table 1-3. In accordance with EPA and CTDEP regulations and guidance, if the maximum ambient impact from a proposed project are less than a SIL, the source is presumed to not cause or significantly contribute to a PSD Increment or NAAQS violation and is not required to perform multiple source cumulative impact assessments.

For minor sources with potential emissions within specified ranges (between 3 and 15 TPY of SO_2 or PM, 5 and 40 TPY of NO_X, an d 5 and 100 TPY of CO), screening calculations conducted in accordance with CTDEP's Stationary Source Stack Height Guideline and Addendum to Stationary Source Stack Height Guideline or other approved screening modeling techniques may be used in lieu of performing refined dispersion modeling. However, for proposed new or modified sources with potential emissions above these ranges and for Major Stationary Sources subject to PSD review, a refined dispersion modeling analysis is performed following CTDEP's Ambient Impact Analysis Guideline (AIAG).

1.3.2 PSD Ambient Impact Analysis Requirements

As discussed in the permit application and in Section 1.2 of this report, PRE will be a Major Stationary Source (> 100 TPY potential emissions) of NO_X and CO emissions. Furthermore, as

Table 1-2 – National and CT Ambient Air Quality Standards and Significant Impact Levels

Pollutant	Averaging Period	CT and National AAQS[(a)] Primary ($\mu g/m^3$)	CT and National AAQS[(a)] Secondary ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)
SO_2	3-Hour	---	1300	1300
	24-Hour	365	---	365
	Annual	80	---	80
NO_2	Annual	100	100	100
O_3 (ppm)[(b)]	1-Hour[(b)]	0.12	0.12	0.12
	8-Hour	0.08	0.08	0.08
$PM_{2.5}$	24-Hour	65	65	65
	Annual	15	15	15
PM_{10}	24-Hour	150	150	150
	Annual	50	50	50
CO	1-Hour	40,000	40,000	40,000
	8-Hour	10,000	10,000	10,000
Lead[(c)]	3-Month[(c)]	1.5	---	1.5

a) All short-term (24 hours or less) values are not to be exceeded more than once per year, except $PM_{2.5}$, for which the 3-year average of the 98th percentile of 24-hour concentrations must not exceed the listed value. All long-term values are not to be exceeded, except for $PM_{2.5}$, for which the 3-year average of the annual arithmetic mean is not to exceed the listed value. To attain the 8-hr ozone standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured over each year must not exceed 0.08 ppm.

b) The 1-hour ambient air quality standard for ozone no longer applies after June 15, 2005, or on such later date as the revocation of the 1-hour standard is effective.

c) Maximum arithmetic mean averaged over a calendar year quarter.

Table 1-3 – Allowable PSD Increments ($\mu g/m^3$)

Pollutant	Averaging Time	Class I	Class II	Class III
PM_{10}[(a)]	Annual	4	17	34
	24-Hour	8	30	60
SO_2	Annual	2	20	40
	24-Hour	5	91	182
	3-Hour	25	512	700
NO_2	Annual	2.5	25	50

a) EPA is in the process of developing an approach for preventing significant deterioration of air quality, which may include $PM_{2.5}$ increments. The EPA has placed this action on a separate administrative track due to the additional time necessary to fully develop any potential proposal. In the interim period, States must continue to implement the PM_{10} increments in 40 CFR 51.166, 52.21 and/or their SIPs, as applicable (EPA Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standards, Federal Register/Vol. 70, No. 210/ November 1, 2005).

shown in Table 1-1, potential emissions of PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO and VOC will be above PSD Significant Emission Rate thresholds. Therefore, PRE will be subject to PSD review requirements for each of the identified pollutants. In addition to the CTDEP ambient impact analysis requirements applicable to minor sources summarized in Section 1.3.1 (i.e., demonstration of compliance with AAQS and PSD Increments), PSD regulations require additional impact analyses to evaluate the impacts of facility emissions on visibility, on soils and vegetation, and to evaluate the potential for impacts due to secondary growth. In addition, if the source is located within 100 kilometers (62 miles) of a federal Class I area, the impacts must be evaluated at these areas based on the more stringent Class I PSD Increments.

1.4 Summary of Modeling Analysis Objectives

In summary, the air quality modeling analysis was performed to satisfy the following objectives:

1. To demonstrate compliance with applicable AAQS for PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, Pb and dioxins[a].
2. To demonstrate compliance with applicable PSD Increments for SO_2, NO_2 and PM_{10}.
3. To justify request for waiver from pre-construction ambient monitoring for all pollutants.
4. To demonstrate that the facility will have not have significant impacts on visibility; on soils and vegetation; or due to secondary growth.

[a] Although potential emissions of lead and dioxins (as defined in RCSA § 22a-174-1) will be less than PSD Significant Emission Rates, single-source modeling was also performed for these pollutants for comparison to applicable SILs, Pre-Construction Monitoring De Minimis Levels and/or applicable AAQS.

2.0 MODEL INPUTS AND PRELIMINARY ANALYSES

2.1 PRE Sources, Emissions and Stack Parameters

As discussed in Section 1.1, the primary emission source at the proposed PRE facility will be the FBG stack. Other ancillary sources will be the emergency diesel engine generator and a wet cooling tower. The diesel generator will only be operated during power interruptions to provide emergency power and lighting when the facility's FBG is not operating and typically once or twice per month for less than an hour for testing purposes. It will also be limited under CTDEP's permit exemption in RCSA § 22a-174-3b(e) to less than 300 hours per consecutive 12-months. The facility's wet cooling tower will operate continuously when the FBG is operated; however, potential emissions are estimated at less than 1 TPY $PM_{10}/PM_{2.5}$. Based on the limited operating scenarios and/or insignificant potential emissions from the emergency diesel generator and cooling tower, the screening and single-source modeling analyses were performed only with the FBG stack. However, both the diesel generator and cooling tower were included in the multiple-source cumulative impact analyses. In addition, GEP stack height and cavity zone impact calculations were performed for both ancillary sources.

Table 2-1 summarizes the emissions, stack temperature, diameter and exhaust volume rate data for four (4) different FBG operating scenarios ranging from approximately 75 to 100% of maximum rated capacity on a Btu heat input basis, which encompass the range of expected biomass fuel compositions and plant operating loads during normal operation. The emissions and stack parameters were initially provided in Attachment E to the air permit application and were obtained from Energy Products of Idaho (EPI), the preferred vendor of the proposed FBG power plant. Table 2-2 summarizes the stack parameters for the emergency generator and cooling tower.

In addition to normal base load operations on biomass fuel, the FBG would be operated with B100 (100 percent biodiesel), a non-fossil fuel, during FBG startups and for initial and maintenance refractory curing purposes. The startup burners are rated at a maximum 100 MMBtu/hr in total and the typical startup duration is 6 hours. The facility will normally be operated as a base load facility and will not require frequent startups and shutdowns. In addition, emissions of all pollutants from the FBG while operating in a startup mode with B100 will be lower than when the FBG is normally operating with biomass fuel.

Another possible, although extremely limited operating scenario, would occur when B100 is stored on site beyond its typical 6-month shelf-life. In that event, PRE has requested the ability to combust B100 in the startup burners for disposal purposes while also operating the FBG on biomass fuel. Since the emission factors (lb/MMBtu) from B100 combustion in the startup burners are lower than those for biomass fuel in the FBG for all pollutants, then the blend of B100 and biomass will result in emissions that are no higher than the normal operating case with 100 percent biomass. In addition, it is anticipated that PRE would fire no more than 20,000 gal/yr of B100 in this manner as there would be no economic incentive to burn B100 other than for disposal of B100 stored beyond its recommended shelf-life. Therefore, this scenario was not separately modeled.

Table 2-1 – Screening Modeling Analysis Input Data – FBG Stack

SOURCE INFORMATION:

Company Name:	Plainfield Renewable Energy LLC					
Equipment Location Address:	Mill Brook Rd., Plainfield, CT					
Equipment Description:	EPI Fluidized Bed Staged Gasifier Energy System					
ORIG (UTM, XY), meters (FBG stack)	X =	756,096 meters East	Y=	4,616,897 meters North	(Datum NAD27, Zone 18)	
	X =	256,549 meters East	Y=	4,616,457 meters North	(Datum NAD27, Zone 19)	
Latitude/Longitude	N	41°39'53"	W	71°55'27"		
Stack base elevation above MSL	184	ft.	56	meters		

OPERATING DATA AND STACK PARAMETERS:

Case	1				2				3				4			
Description	100/0 C&D/Wood				25/75 C&D/Wood				65/35 C&D/Wood				25/75 C&D/Wood			
% Load	91%				100%				95%				75%			
Exhaust Gas Flow Rate	3474	ft^3/sec	98.40	m^3/sec	3443	ft^3/sec	97.51	m^3/sec	3578	ft^3/sec	101.32	m^3/sec	2738	ft^3/sec	77.53	m^3/sec
Stack Exhaust Temp.	253	deg. F	395.93	deg. K	253	deg. F	395.93	deg. K	253	deg. F	395.93	deg. K	253	deg. F	395.93	deg. K
Stack Height	155	ft.	47.24	m	155	ft.	47.24	m	155	ft.	47.24	m	155	ft.	47.24	m
Stack Diameter	9.00	ft.	2.74	m	9	ft.	2.74	m	9	ft.	2.74	m	9	ft.	2.74	m
Stack Velocity	54.61	ft/sec	16.65	m/sec	54.12	ft/sec	16.50	m/sec	56.24	ft/sec	17.14	m/sec	43.04	ft/sec	13.12	m/sec
Proposed Controlled Emission Rates (1-hour to 24-hour averages)																
PM_{10}	9.94	lb/hr	1.25	g/sec	10.57	lb/hr	1.33	g/sec	9.94	lb/hr	1.25	g/sec	7.74	lb/hr	0.98	g/sec
NO_2	35.64	lb/hr	4.49	g/sec	38.45	lb/hr	4.84	g/sec	37.03	lb/hr	4.67	g/sec	28.99	lb/hr	3.65	g/sec
SO_2	16.82	lb/hr	2.12	g/sec	18.56	lb/hr	2.34	g/sec	17.03	lb/hr	2.15	g/sec	13.99	lb/hr	1.76	g/sec
CO	49.98	lb/hr	6.30	g/sec	49.38	lb/hr	6.22	g/sec	49.78	lb/hr	6.27	g/sec	37.49	lb/hr	4.72	g/sec
Pb	0.067	lb/hr	0.0084	g/sec	0.073	lb/hr	0.0092	g/sec	0.069	lb/hr	0.0087	g/sec	0.055	lb/hr	0.0070	g/sec

Table 2-2 – Stack Parameters for PRE Emergency Generator and Cooling Tower

Emergency Generator Stack (Stack 2)					Cooling Tower (Stack 3)				
UTM, Zone 18 NAD27	X(m) =	756,040	Y(m) =	4,616,867	UTM, Zone 18 NAD27	X(m) =	756,037	Y(m) =	4,616,892
Exhaust Flow Rate	65	ft^3/sec	1.85	m^3/sec	Exhaust Flow Rate	30509	ft^3/sec	864.02	m^3/sec
Stack Temp.	948	deg. F	782.04	deg. K	Stack Temp.	98	deg. F	309.82	deg. K
Stack Base Elev.	177	ft.	54	m	Stack Base Elev.	174	ft.	53	m
Physical Stack Ht.	10	ft.	3.05	m	Physical Stack Ht.	42.8	ft.	13.06	m
Stack Height MSL	187	ft.	3.05	m	Stack Height MSL	217	ft.	13.06	m
Stack Diameter	0.5	ft.	0.15	m	Stack Diameter	39.6	ft.	12.07	m
Stack Velocity	333	ft/sec	101.61	m/sec	Stack Velocity	24.77	ft/sec	7.55	m/sec
Proposed Emission Rates (1-hour to 24-hour averages)[1]					**Proposed Emission Rates (1-hour to 24-hour averages)[1]**				
$PM_{2.5}$	0.47	lb/hr	0.06	g/sec	$PM_{2.5}$	0.15	lb/hr	0.02	g/sec
NO_2	16.09	lb/hr	2.03	g/sec	NO_2		lb/hr		g/sec
SO_2	0.01	lb/hr	0.001	g/sec	SO_2		lb/hr		g/sec
Proposed Emission Rates (annual averages)					**Proposed Emission Rates (annual averages)**				
$PM_{2.5}$	0.07	TPY	0.002	g/sec	$PM_{2.5}$	0.65	TPY	0.02	g/sec
NO_2	2.41	TPY	0.07	g/sec	NO_2		TPY		g/sec
SO_2	0.001	TPY	0.00003	g/sec	SO_2		TPY		g/sec

2.2 Good Engineering Practice (GEP) Stack Height Analysis

Stack height and building dimensional data for the GEP, cavity and downwash analyses are summarized in Table 2-3. The GEP stack height analysis was conducted in accordance with the methodology described in EPA's Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations (June 1985); the calculations are summarized in Table 2-4 through Table 2-6, for the FBG, emergency generator and cooling tower, respectively. The building dimensional data as well as the layout and orientation of buildings on site are based on the site plan and general arrangement plans presented in Appendix A.

The calculated GEP stack height for the FBG stack, generator stack and cooling tower is 78.49 meters (without accounting for differences in stack base and building ground level elevations), based on the dimensions of the Power House – Tier 4 (Boiler Building), identified as BLD_1 Tier 4. With respect to other significant structures at the PRE premise, the FBG stack is either above the calculated GEP height or located beyond a distance of 5L from the building or structure (i.e., located beyond the distance where those structures are capable of causing downwash on the stacks). The proposed stack heights (47.24 meters for the FBG stack, 3 meters for the generator stack and 13 meters for the cooling tower) are less than the GEP stack height calculated for the controlling structure (BLD_1 Tier 4) and the stacks are also located within the 5L zone of influence from that structure. Therefore, a cavity zone impact analysis was performed based on the dimensions of the controlling structures. Results of the cavity impact analysis are further discussed below and the calculations are summarized in Table 2-7 through Table 2-9.

Downwash effects due to all structures on the proposed site were also evaluated using the EPA Building Profile Input Program (BPIP, dated 04274) using the PRIME algorithm. The direction-specific dimensions produced by the BPIP model were included in the ISCST3 screening and refined modeling analyses. The BPIP model output is included in Appendix B.

2.3 Cavity Zone Impact Analysis

Based on the results of the GEP stack height analysis summarized in Table 2-4, only the Power House Boiler Building (BLD_1 Tier 4) has a calculated GEP stack height greater than the proposed FBG stack height and the stack is located within the 5L zone of influence from the structure. Therefore, there is the potential for air pollutants to be trapped in the cavity region, which is a recirculating eddy of air within the wake region of the structure. The two CTDEP-approved methods of evaluating cavity impacts are: (1) the calculation procedure outlined in Appendix C of the EPA document Regional Workshops on Air Quality Modeling: A Summary Report (Revised October, 1983); and (2) the building cavity algorithm contained in the SCREEN3 screening dispersion model. In the calculation procedure from the Regional Workshops report, the cavity height, $H_C = H_B + 0.5L$, where H_B is the height of the structure and L is the lesser dimension of the height or projected width of the structure. In the SCREEN3 algorithm, $H_C = H_B (1.0 +1.6 \exp(-1.3L/H_B)$, where L = along wind building dimension. H_C by the SCREEN3 procedure is calculated for two orientations, first with the minimum horizontal dimension along wind and then for the maximum horizontal dimension along wind. With either

Table 2-3 – Dimensional Data For GEP Stack Height and Cavity Impact Analysis

Object	Structure/Equipment Description	Height (meters)	Length (meters)	Width (meters)	Distance to Nearest Property Boundary (meters)	Distance to Stack #1 (meters)	Distance to Stack #2 (meters)	Distance to Stack #3 (meters)
Stack 1	FBG stack	47.2			21.0			
Stack 2	Emergency Generator stack	3.1			33.0			
Stack 3	Cooling Tower	13.1			20.0			
Structure #	**Structure Name**							
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	3.66	60.05	53.64	33.5	54.9	6.0	30.5
BLD_1 Tier 2	Power House - Tier 2 (Control Room)	10.97	60.05	53.64	33.5	54.9	6.0	30.5
BLD_1 Tier 3	Power House - Tier 3 (Turbine Bldg.)	18.90	60.05	47.55	39.6	54.9	8.5	33.4
BLD_1 Tier 4	Power House - Tier 4 (Boiler Bldg.)	31.39	60.05	32.31	54.9	54.9	23.0	44.5
BLD_2	Baghouse	17.68	15.24	9.14	38.1	14.0	41.5	48.5
BLD_3	Spray Dryer	26.21	7.32	7.32	57.0	32.9	38.6	50.0
BLD_4	Covered Hogged Wood Storage	13.72	91.44	60.96	33.2	219.5	170.6	192.0
BLD_5	Cooling Tower	13.06	29.47	13.01	14.3	45.5	10.0	0.0
BLD_6	Filtered Water Storage Tank	11.58	18.29	18.29	40.4	76.5	65.9	87.6
BLD_7	Lime Storage Silo	6.10	6.10	6.10	57.5	37.0	48.8	61.9
BLD_8	Ash Silo	19.20	7.62	7.62	34.6	17.2	59.8	63.9
BLD_9	Demin Water Storage Tank	3.66	4.57	4.57	58.9	64.3	60.2	79.6
BLD_10	Clarifier	5.18	10.97	10.97	16.4	22.0	82.0	83.1
BLD_11	Thickener	3.35	3.05	3.05	33.1	28.6	77.0	81.3
BLD_12	Filter Press Bldg.	3.05	7.62	7.62	30.3	30.8	83.0	88.8
BLD_13	Diesel Emergency Generator Enclosure	1.80	5.80	1.60	32.5	58.0	0.0	20.1

Table 2-4 – Preliminary GEP Stack Height Analysis – FBG Stack

Fluid Bed Gasifier Stack Height, meters = 47.24

Structure #	Description	Building Height HB (meters)	Building Length BL (meters)	Building Width BW (meters)	Maximum Projected Width[1] (m)	De[2] (meters)	Building Type	Influence Distance (5L) (meters)	Actual Distance To Stack (m)	Within Influence?	GEP[3] Height (meters)	GEP Height (feet)	H_s>GEP?	Perform Cavity Analysis?
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	3.66	60.05	53.64	80.52	80.52	squat	18.29	54.90	NO	9.14	30.00	Yes	No Influence
BLD_1 Tier 2	Power House - Tier 2 (Control Room)	10.97	60.05	53.64	80.52	80.52	squat	54.86	54.86	Yes	27.43	90.00	Yes	No Influence
BLD_1 Tier 3	Power House - Tier 3 (Turbine Bldg.)	18.90	60.05	47.55	76.59	76.59	squat	94.49	54.86	Yes	47.24	155.00	Yes	No Influence
BLD_1 Tier 4	Power House - Tier 4 (Boiler Bldg.)	31.39	60.05	32.31	68.19	68.19	squat	156.97	54.86	Yes	78.49	257.50	No	**Yes**
BLD_2	Baghouse	17.68	15.24	9.14	17.77	17.77	tall	88.39	14.02	Yes	44.20	145.00	Yes	No Influence
BLD_3	Spray Dryer	26.21	7.32	7.32	10.35	26.21	tall	51.73	32.92	Yes	41.73	136.91	Yes	No Influence
BLD_4	Covered Hogged Wood Storage	13.72	91.44	60.96	109.90	109.90	squat	68.58	219.46	NO	34.29	112.50	Yes	No Influence
BLD_5	Cooling Tower	13.06	29.47	13.01	32.21	32.21	squat	65.29	45.50	Yes	32.64	107.10	Yes	No Influence
BLD_6	Filtered Water Storage Tank	11.58	18.29	18.29	25.86	25.86	squat	57.90	76.50	NO	28.95	94.98	Yes	No Influence
BLD_7	Lime Storage Silo	6.10	6.10	6.10	8.62	8.62	tall	30.50	37.00	NO	15.25	50.03	Yes	No Influence
BLD_8	Ash Silo	19.20	7.62	7.62	10.78	19.20	tall	53.88	17.20	Yes	35.36	116.03	Yes	No Influence
BLD_9	Demin Water Storage Tank	3.66	4.57	4.57	6.47	6.47	squat	18.30	64.30	NO	9.15	30.02	Yes	No Influence
BLD_10	Clarifier	5.18	10.97	10.97	15.51	15.51	squat	25.90	22.00	Yes	12.95	42.49	Yes	No Influence
BLD_11	Thickener	3.35	3.05	3.05	4.31	4.31	tall	16.75	28.60	NO	8.38	27.48	Yes	No Influence
BLD_12	Filter Press Bldg.	3.05	7.62	7.62	10.78	10.78	squat	15.25	30.80	NO	7.63	25.02	Yes	No Influence
BLD_13	Diesel Emergency Generator Enclosure	1.80	5.80	1.60	6.02	6.02	squat	9.00	58.00	NO	4.50	14.76	Yes	No Influence

1 $[BL2 + BW2]^{1/2}$
2 Greater of Max. Projected Width or HB
3 HB + 1.5L, where L = lesser of HB or Projected Width

Table 2-5 – Preliminary GEP Stack Height Analysis – Emergency Generator Stack

Emergency Generator Stack Height, meters = 3.06

Structure #	Description	Building Height HB (meters)	Building Length BL (meters)	Building Width BW (meters)	Maximum Projected Width[1] (m)	De[2] (meters)	Building Type	Influence Distance (5L) (meters)	Actual Distance To Stack (m)	Within Influence?	GEP[3] Height (meters)	GEP Height (feet)	H_s>GEP?	Perform Cavity Analysis?
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	3.66	60.05	53.64	80.52	80.52	squat	18.29	6.0	Yes	9.14	30.00	No	Yes
BLD_1 Tier 2	Power House - Tier 2 (Control Room)	10.97	60.05	53.64	80.52	80.52	squat	54.86	6.0	Yes	27.43	90.00	No	Yes
BLD_1 Tier 3	Power House - Tier 3 (Turbine Bldg.)	18.90	60.05	47.55	76.59	76.59	squat	94.49	8.5	Yes	47.24	155.00	No	Yes
BLD_1 Tier 4	Power House - Tier 4 (Boiler Bldg.)	31.39	60.05	32.31	68.19	68.19	squat	156.97	23.0	Yes	78.49	257.50	No	Yes
BLD_2	Baghouse	17.68	15.24	9.14	17.77	17.77	tall	88.39	41.5	Yes	44.20	145.00	No	Yes
BLD_3	Spray Dryer	26.21	7.32	7.32	10.35	26.21	tall	51.73	38.6	Yes	41.73	136.91	No	Yes
BLD_4	Covered Hogged Wood Storage	13.72	91.44	60.96	109.90	109.90	squat	68.58	170.6	NO	34.29	112.50	No	No Influence
BLD_5	Cooling Tower	13.06	29.47	13.01	32.21	32.21	squat	65.29	10.0	Yes	32.64	107.10	No	Yes
BLD_6	Filtered Water Storage Tank	11.58	18.29	18.29	25.86	25.86	squat	57.90	65.9	NO	28.95	94.98	No	No Influence
BLD_7	Lime Storage Silo	6.10	6.10	6.10	8.62	8.62	tall	30.50	48.8	NO	15.25	50.03	No	No Influence
BLD_8	Ash Silo	19.20	7.62	7.62	10.78	19.20	tall	53.88	59.8	NO	35.36	116.03	No	No Influence
BLD_9	Demin Water Storage Tank	3.66	4.57	4.57	6.47	6.47	squat	18.30	60.2	NO	9.15	30.02	No	No Influence
BLD_10	Clarifier	5.18	10.97	10.97	15.51	15.51	squat	25.90	82.0	NO	12.95	42.49	No	No Influence
BLD_11	Thickener	3.35	3.05	3.05	4.31	4.31	tall	16.75	77.0	NO	8.38	27.48	No	No Influence
BLD_12	Filter Press Bldg.	3.05	7.62	7.62	10.78	10.78	squat	15.25	83.0	NO	7.63	25.02	No	No Influence
BLD_13	Diesel Emergency Generator Enclosure	1.80	5.80	1.60	6.02	6.02	squat	9.00	0.0	Yes	4.50	14.76	No	Yes

1 $[BL2 + BW2]^{1/2}$
2 Greater of Max. Projected Width or HB
3 HB + 1.5L, where L = lesser of HB or Projected Width

Table 2-6 – Preliminary GEP Stack Height Analysis – Cooling Tower

Cooling Tower Height, meters = 13.06

Structure #	Description	Building Height HB (meters)	Building Length BL (meters)	Building Width BW (meters)	Maximum Projected Width[1] (m)	De[2] (meters)	Building Type	Influence Distance (5L) (meters)	Actual Distance To Stack (m)	Within Influence?	GEP[3] Height (meters)	GEP Height (feet)	H_s>GEP?	Perform Cavity Analysis?
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	3.66	60.05	53.64	80.52	80.52	squat	18.29	30.5	NO	9.14	30.00	Yes	No Influence
BLD_1 Tier 2	Power House - Tier 2 (Control Room)	10.97	60.05	53.64	80.52	80.52	squat	54.86	30.5	Yes	27.43	90.00	No	Yes
BLD_1 Tier 3	Power House - Tier 3 (Turbine Bldg.)	18.90	60.05	47.55	76.59	76.59	squat	94.49	33.4	Yes	47.24	155.00	No	Yes
BLD_1 Tier 4	Power House - Tier 4 (Boiler Bldg.)	31.39	60.05	32.31	68.19	68.19	squat	156.97	44.5	Yes	78.49	257.50	No	Yes
BLD_2	Baghouse	17.68	15.24	9.14	17.77	17.77	tall	88.39	48.5	Yes	44.20	145.00	No	Yes
BLD_3	Spray Dryer	26.21	7.32	7.32	10.35	26.21	tall	51.73	50.0	Yes	41.73	136.91	No	Yes
BLD_4	Covered Hogged Wood Storage	13.72	91.44	60.96	109.90	109.90	squat	68.58	192.0	NO	34.29	112.50	No	No Influence
BLD_5	Cooling Tower	13.06	29.47	13.01	32.21	32.21	squat	65.29	0.0	Yes	32.64	107.10	No	Yes
BLD_6	Filtered Water Storage Tank	11.58	18.29	18.29	25.86	25.86	squat	57.90	87.6	NO	28.95	94.98	No	No Influence
BLD_7	Lime Storage Silo	6.10	6.10	6.10	8.62	8.62	tall	30.50	61.9	NO	15.25	50.03	No	No Influence
BLD_8	Ash Silo	19.20	7.62	7.62	10.78	19.20	tall	53.88	63.9	NO	35.36	116.03	No	No Influence
BLD_9	Demin Water Storage Tank	3.66	4.57	4.57	6.47	6.47	squat	18.30	79.6	NO	9.15	30.02	Yes	No Influence
BLD_10	Clarifier	5.18	10.97	10.97	15.51	15.51	squat	25.90	83.1	NO	12.95	42.49	Yes	No Influence
BLD_11	Thickener	3.35	3.05	3.05	4.31	4.31	tall	16.75	81.3	NO	8.38	27.48	Yes	No Influence
BLD_12	Filter Press Bldg.	3.05	7.62	7.62	10.78	10.78	squat	15.25	88.8	NO	7.63	25.02	Yes	No Influence
BLD_13	Diesel Emergency Generator Enclosure	1.80	5.80	1.60	6.02	6.02	squat	9.00	20.1	NO	4.50	14.76	Yes	No Influence

1 $[BL2 + BW2]^{1/2}$
2 Greater of Max. Projected Width or HB
3 HB + 1.5L, where L = lesser of HB or Projected Width

Table 2-7 – Cavity Region Analysis – FBG Stack

Constants:

Ta (°K) =	293.15	d_s (m) =	2.743
Ts (°F) =	253	u_c (m/sec) =	7.5
Ts (°K) =	395.93	b =	0.91
V_s (m/sec)[1] =	13.12	H_s (m) =	47.24
d_S (ft) =	9.00		

Structure #	Building Description	Building Height HB (meters)	Building Length BL (meters)	Building Width BW (meters)	Projected Width PW1 (m)	The Lesser of HB & PW L (meters)	Cavity Height[2] Hc (meters)	Cavity Height[3] Hc (meters)	Cavity Height[3] Hc (meters)	Momentum Flux Fm (m^4/s^2)	Plume Rise Hm (meters)
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_1 Tier 2	Power House - Tier 2 (Control Room)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_1 Tier 3	Power House - Tier 3 (Turbine Bldg.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_1 Tier 4	**Power House - Tier 4 (Boiler Bldg.)**	**31.39**	**60.05**	**32.31**	**68.19**	**31.39**	**47.09**	**44.58**	**35.57**	**239.71**	**9.93**
BLD_2	Baghouse	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_3	Spray Dryer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_4	Covered Hogged Wood Storage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_5	Cooling Tower	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_6	Filtered Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_7	Lime Storage Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_8	Ash Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_9	Demin Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_10	Clarifier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_11	Thickener	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_12	Filter Press Bldg.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_13	Diesel Emergency Generator Enclosure	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Structure #	Building Description	Plume Height Hp (meters)	Cavity Capture?	Influence Distance (3L) (meters)	Bldg Distance to Stack (meters)	Within Building Influence?	Distance to Property Line (meters)	Cavity Length 1 Xr (meters)	Cavity Length 2 Xr (meters)	Stack Within Cavity?[4]	Cavity Entirely On Property?
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_1 Tier 2	Power House - Tier 2 (Control Room)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_1 Tier 3	Power House - Tier 3 (Turbine Bldg.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_1 Tier 4	**Power House - Tier 4 (Boiler Bldg.)**	**57.18**	**No**	**94.18**	**54.86**	**Yes**	**54.86**	**27.30**	**75.73**	**No**	**No**
BLD_2	Baghouse	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_3	Spray Dryer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_4	Covered Hogged Wood Storage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_5	Cooling Tower	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_6	Filtered Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_7	Lime Storage Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_8	Ash Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_9	Demin Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_10	Clarifier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_11	Thickener	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_12	Filter Press Bldg.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_13	Diesel Emergency Generator Enclosure	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

1. Minimum stack velocity from all screening modeling operating load cases.
2. HC = HB + 0.5L, based on procedure in Appendix C of 1983 Addendum to EPA "Regional Workshops on Air Quality Modeling: A Summary Report."
3. HC = HB (1.0 +1.6 exp(-1.3L/HB), based on cavity height calculation used by SCREEN3, where L = along wind building dimension. HC by the SCREEN3 procedure is calculated for two orientations, first with the minimum horizontal dimension along wind and then for the maximum horizontal dimension along wind.
4. Stack is considered in the cavity if both the plume height is less than the cavity height and the actual distance between the stack and the building is less than the maximum cavity length.

N/A = Stack is not subject to cavity effects because it is located outside the 5L building zone of influence or the stack height is greater than the calculated GEP height.

Table 2-8 – Cavity Region Analysis – Emergency Generator Stack

Constants:

Ta (°K) =	293.15	d_s (m) =	0.152
Ts (°F) =	948	u_c (m/sec) =	7.5
Ts (°K) =	782.04	b =	0.41
V_s (m/sec)[1] =	101.61	H_s (m) =	3.05
d_S (ft) =	0.50		

Structure #	Building Description	Building Height HB (meters)	Building Length BL (meters)	Building Width BW (meters)	Projected Width PW1 (m)	The Lesser of HB & PW L (meters)	Cavity Height[2] Hc (meters)	Cavity Height[3] Hc (meters)	Cavity Height[3] Hc (meters)	Momentum Flux Fm (m^4/s^2)	Plume Rise Hm (meters)
BLD_1 Tier 1	**Power House - Tier 1 (Admin Bldg.)**	**3.66**	**60.05**	**53.64**	**80.52**	**3.66**	**5.49**	**3.66**	**3.66**	**22.47**	**3.75**
BLD_1 Tier 2	**Power House - Tier 2 (Control Room)**	**10.97**	**60.05**	**53.64**	**80.52**	**10.97**	**16.46**	**11.00**	**10.99**	**22.47**	**5.41**
BLD_1 Tier 3	**Power House - Tier 3 (Turbine Bldg.)**	**18.90**	**60.05**	**47.55**	**76.59**	**18.90**	**28.35**	**20.05**	**19.38**	**22.47**	**6.49**
BLD_1 Tier 4	**Power House - Tier 4 (Boiler Bldg.)**	**31.39**	**60.05**	**32.31**	**68.19**	**31.39**	**47.09**	**44.58**	**35.57**	**22.47**	**7.69**
BLD_2	**Baghouse**	**17.68**	**15.24**	**9.14**	**17.77**	**17.68**	**26.52**	**32.12**	**26.90**	**22.47**	**6.35**
BLD_3	**Spray Dryer**	**26.21**	**7.32**	**7.32**	**10.35**	**10.35**	**31.39**	**55.39**	**55.39**	**22.47**	**7.24**
BLD_4	Covered Hogged Wood Storage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_5	**Cooling Tower**	**13.06**	**29.47**	**13.01**	**32.21**	**13.06**	**19.59**	**18.78**	**14.17**	**22.47**	**5.74**
BLD_6	Filtered Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_7	Lime Storage Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_8	Ash Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_9	Demin Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_10	Clarifier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_11	Thickener	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_12	Filter Press Bldg.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_13	**Diesel Emergency Generator Enclosure**	**1.80**	**5.80**	**1.60**	**6.02**	**1.80**	**2.70**	**2.71**	**1.84**	**22.47**	**2.96**

Structure #	Building Description	Plume Height Hp (meters)	Cavity Capture?	Influence Distance (3L) (meters)	Bldg Distance to Stack (meters)	Within Building Influence?	Distance to Property Line (meters)	Cavity Length 1 Xr (meters)	Cavity Length 2 Xr (meters)	Stack Within Cavity?[4]	Cavity Entirely On Property?
BLD_1 Tier 1	**Power House - Tier 1 (Admin Bldg.)**	**6.80**	**No**	**10.97**	**6.00**	**Yes**	**33.50**	**20.12**	**20.59**	**No**	**Yes**
BLD_1 Tier 2	**Power House - Tier 2 (Control Room)**	**8.46**	**Yes**	**32.92**	**6.00**	**Yes**	**33.53**	**42.25**	**44.37**	**Yes**	**No**
BLD_1 Tier 3	**Power House - Tier 3 (Turbine Bldg.)**	**9.54**	**Yes**	**56.69**	**8.50**	**Yes**	**39.62**	**51.08**	**58.56**	**Yes**	**No**
BLD_1 Tier 4	**Power House - Tier 4 (Boiler Bldg.)**	**10.74**	**Yes**	**94.18**	**23.00**	**Yes**	**54.86**	**27.30**	**75.73**	**Yes**	**No**
BLD_2	**Baghouse**	**9.40**	**Yes**	**53.04**	**41.50**	**Yes**	**38.10**	**16.49**	**35.31**	**No**	**Yes**
BLD_3	**Spray Dryer**	**10.29**	**Yes**	**31.04**	**38.60**	**No**	**57.00**	**27.33**	**27.33**	**No**	**Yes**
BLD_4	Covered Hogged Wood Storage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_5	**Cooling Tower**	**8.79**	**Yes**	**39.17**	**10.00**	**Yes**	**14.33**	**18.22**	**36.54**	**Yes**	**No**
BLD_6	Filtered Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_7	Lime Storage Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_8	Ash Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_9	Demin Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_10	Clarifier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_11	Thickener	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_12	Filter Press Bldg.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_13	**Diesel Emergency Generator Enclosure**	**6.01**	**No**	**5.40**		**Yes**	**32.50**	**2.29**	**7.07**	**No**	**Yes**

Table 2-8 (Continued)

Structure #	Building Description	Normalized Cavity Conc. Wind Dir. 1 (µg/m³)	Normalized Cavity Conc. Wind Dir. 2 (µg/m³)	NOx Annual Conc. (µg/m³)	CO 1-Hour Conc. (µg/m³)	CO 8-Hour Conc. (µg/m³)	PM10/2.5 24-Hr Conc. (µg/m³)	PM10/2.5 annual Conc. (µg/m³)	SO2 3-Hour Conc. (µg/m³)	SO2 24-Hour Conc. (µg/m³)	SO2 annual Conc. (µg/m³)
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	0	0	0	0	0	0	0	0	0	0
BLD_1 Tier 2	Power House - Tier 2 (Control Room)	202.37	226.51	0.39	105.25	73.67	5.36	0.01	0.20	0.09	0.0002
BLD_1 Tier 3	Power House - Tier 3 (Turbine Bldg.)	117.50	148.39	0.26	68.95	48.26	3.51	0.01	0.13	0.06	0.0001
BLD_1 Tier 4	Power House - Tier 4 (Boiler Bldg.)	70.73	131.45	0.23	61.08	42.76	3.11	0.01	0.12	0.05	0.0001
BLD_2	Baghouse	0	0	0	0	0	0	0	0	0	0
BLD_3	Spray Dryer	0	0	0	0	0	0	0	0	0	0
BLD_4	Covered Hogged Wood Storage	0	0	0	0	0	0	0	0	0	0
BLD_5	Cooling Tower	346.55	785.12	1.36	364.81	255.36	18.57	0.04	0.70	0.31	0.0007
BLD_6	Filtered Water Storage Tank	0	0	0	0	0	0	0	0	0	0
BLD_7	Lime Storage Silo	0	0	0	0	0	0	0	0	0	0
BLD_8	Ash Silo	0	0	0	0	0	0	0	0	0	0
BLD_9	Demin Water Storage Tank	0	0	0	0	0	0	0	0	0	0
BLD_10	Clarifier	0	0	0	0	0	0	0	0	0	0
BLD_11	Thickener	0	0	0	0	0	0	0	0	0	0
BLD_12	Filter Press Bldg.	0	0	0	0	0	0	0	0	0	0
BLD_13	Diesel Emergency Generator Enclosure	0	0	0	0	0	0	0	0	0	0
	CTDEP Adverse Impact Level:			12.5	5000	1250	18.8/8.1	6.3/1.9	162.5	32.5	7.5
	Significant Impact Level			1	2000	500	5/2	1/0.3	25	5	1
	AAQS			100	40000	10000	150/65	50/15	1300	260	60

1. Minimum stack velocity from all screening modeling operating load cases.
2. HC = HB + 0.5L, based on procedure in Appendix C of 1983 Addendum to EPA "Regional Workshops on Air Quality Modeling: A Summary Report."
3. HC = HB (1.0 +1.6 exp(-1.3L/HB), based on cavity height calculation used by SCREEN3, where L = along wind building dimension. HC by the SCREEN3 procedure is calculated for two orientations, first with the minimum horizontal dimension along wind and then for the maximum horizontal dimension along wind.
4. Stack is considered in the cavity if both the plume height is less than the cavity height and the actual distance between the stack and the building is less than the maximum cavity length.
5. Normalized cavity concentration based on 1 g/sec emission rate, and estimated by the Hosker (1984) approximation used in the SCREEN3 model, C = Q/(1.5 A u), where Q is the emission rate (1 g/sec), A is the cross-sectional area of the building normal to the wind (m2) and u is the wind speed (m/sec), assumed to be 5 m/sec. 1-hr concentrations were converted to 3-hr, 8-hr, 24-hr and annual concentrations using the following conversions, respectively: 0.9, 0.7, 0.4, 0.025.

N/A = Stack is not subject to cavity effects because it is located outside the 5L building zone of influence or the stack height is greater than the calculated GEP height.

Table 2-9 – Cavity Region Analysis – Cooling Tower

Constants:

Ta (°K) =	293.15	d_s (m) =	12.069
Ts (°F) =	98	u_c (m/sec) =	7.5
Ts (°K) =	309.82	b =	1.33
V_s (m/sec)[1] =	7.55	H_s (m) =	13.06
d_S (ft) =	39.60		

Structure #	Building Description	Building Height HB (meters)	Building Length BL (meters)	Building Width BW (meters)	Projected Width PW1 (m)	The Lesser of HB & PW L (meters)	Cavity Height[2] Hc (meters)	Cavity Height[3] Hc (meters)	Cavity Height[3] Hc (meters)	Momentum Flux Fm (m^4/s^2)	Plume Rise Hm (meters)
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_1 Tier 2	**Power House - Tier 2 (Control Room)**	**10.97**	**60.05**	**53.64**	**80.52**	**10.97**	**16.46**	**11.00**	**10.99**	**1965.16**	**10.93**
BLD_1 Tier 3	**Power House - Tier 3 (Turbine Bldg.)**	**18.90**	**60.05**	**47.55**	**76.59**	**18.90**	**28.35**	**20.05**	**19.38**	**1965.16**	**13.11**
BLD_1 Tier 4	**Power House - Tier 4 (Boiler Bldg.)**	**31.39**	**60.05**	**32.31**	**68.19**	**31.39**	**47.09**	**44.58**	**35.57**	**1965.16**	**15.52**
BLD_2	**Baghouse**	**17.68**	**15.24**	**9.14**	**17.77**	**17.68**	**26.52**	**32.12**	**26.90**	**1965.16**	**12.82**
BLD_3	**Spray Dryer**	**26.21**	**7.32**	**7.32**	**10.35**	**10.35**	**31.39**	**55.39**	**55.39**	**1965.16**	**14.62**
BLD_4	Covered Hogged Wood Storage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_5	**Cooling Tower**	**13.06**	**29.47**	**13.01**	**32.21**	**13.06**	**19.59**	**18.78**	**14.17**	**1965.16**	**11.59**
BLD_6	Filtered Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_7	Lime Storage Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_8	Ash Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_9	Demin Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_10	Clarifier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_11	Thickener	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_12	Filter Press Bldg.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_13	Diesel Emergency Generator Enclosure	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Structure #	Building Description	Plume Height Hp (meters)	Cavity Capture?	Influence Distance (3L) (meters)	Bldg Distance to Stack (meters)	Within Building Influence?	Distance to Property Line (meters)	Cavity Length 1 Xr (meters)	Cavity Length 2 Xr (meters)	Stack Within Cavity?[4]	Cavity Entirely On Property?
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_1 Tier 2	**Power House - Tier 2 (Control Room)**	**23.99**	**No**	**32.92**	**30.50**	**Yes**	**33.53**	**42.25**	**44.37**	**No**	**No**
BLD_1 Tier 3	**Power House - Tier 3 (Turbine Bldg.)**	**26.16**	**Yes**	**56.69**	**33.40**	**Yes**	**39.62**	**51.08**	**58.56**	**Yes**	**No**
BLD_1 Tier 4	**Power House - Tier 4 (Boiler Bldg.)**	**28.58**	**Yes**	**94.18**	**44.50**	**Yes**	**54.86**	**27.30**	**75.73**	**Yes**	**No**
BLD_2	**Baghouse**	**25.88**	**Yes**	**53.04**	**48.50**	**Yes**	**38.10**	**16.49**	**35.31**	**No**	**Yes**
BLD_3	**Spray Dryer**	**27.67**	**Yes**	**31.04**	**50.00**	**No**	**57.00**	**27.33**	**27.33**	**No**	**Yes**
BLD_4	Covered Hogged Wood Storage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_5	**Cooling Tower**	**24.64**	**No**	**39.17**		**Yes**	**14.33**	**18.22**	**36.54**	**No**	**No**
BLD_6	Filtered Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_7	Lime Storage Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_8	Ash Silo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_9	Demin Water Storage Tank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_10	Clarifier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_11	Thickener	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_12	Filter Press Bldg.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLD_13	Diesel Emergency Generator Enclosure	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2-9 (Continued)

Structure #	Building Description	Normalized Cavity Conc. Wind Dir. 1 (μg/m³)	Normalized Cavity Conc. Wind Dir. 2 (μg/m³)	NOx Annual Conc. (μg/m³)	CO 1-Hour Conc. (μg/m³)	CO 8-Hour Conc. (μg/m³)	PM10/2.5 24-Hr Conc. (μg/m³)	PM10/2.5 annual Conc. (μg/m³)	SO2 3-Hour Conc. (μg/m³)	SO2 24-Hour Conc. (μg/m³)	SO2 annual Conc. (μg/m³)
BLD_1 Tier 1	Power House - Tier 1 (Admin Bldg.)	0	0	0	0	0	0	0	0	0	0
BLD_5	Power House - Tier 2 (Control Room)	0	0	0	0	0	0	0	0	0	0
BLD_6	Power House - Tier 3 (Turbine Bldg.)	117.50	148.39				1.12	0.07			
BLD_7	Power House - Tier 4 (Boiler Bldg.)	70.73	131.45				0.99	0.06			
BLD_8	Baghouse	0	0	0	0	0	0	0	0	0	0
BLD_9	Spray Dryer	0	0	0	0	0	0	0	0	0	0
BLD_10	Covered Hogged Wood Storage	0	0	0	0	0	0	0	0	0	0
BLD_11	Cooling Tower	0	0	0	0	0	0	0	0	0	0
BLD_12	Filtered Water Storage Tank	0	0	0	0	0	0	0	0	0	0
BLD_13	Lime Storage Silo	0	0	0	0	0	0	0	0	0	0
	Ash Silo	0	0	0	0	0	0	0	0	0	0
	Demin Water Storage Tank	0	0	0	0	0	0	0	0	0	0
	Clarifier	0	0	0	0	0	0	0	0	0	0
	Thickener	0	0	0	0	0	0	0	0	0	0
	Filter Press Bldg.	0	0	0	0	0	0	0	0	0	0
	Diesel Emergency Generator Enclosure	0	0	0	0	0	0	0	0	0	0
	CTDEP Adverse Impact Level:			12.5	5000	1250	18.8/8.1	6.3/1.9	162.5	32.5	7.5
	Significant Impact Level			1	2000	500	5/2	1/0.3	25	5	1
	AAQS			100	40000	10000	150/65	50/15	1300	260	60

1. Minimum stack velocity from all screening modeling operating load cases.
2. HC = HB + 0.5L, based on procedure in Appendix C of 1983 Addendum to EPA "Regional Workshops on Air Quality Modeling: A Summary Report."
3. HC = HB (1.0 +1.6 exp(-1.3L/HB), based on cavity height calculation used by SCREEN3, where L = along wind building dimension. HC by the SCREEN3 procedure is calculated for two orientations, first with the minimum horizontal dimension along wind and then for the maximum horizontal dimension along wind.
4. Stack is considered in the cavity if both the plume height is less than the cavity height and the actual distance between the stack and the building is less than the maximum cavity length.
5. Normalized cavity concentration based on 1 g/sec emission rate, and estimated by the Hosker (1984) approximation used in the SCREEN3 model, C = Q/(1.5 A u), where Q is the emission rate (1 g/sec), A is the cross-sectional area of the building normal to the wind (m2) and u is the wind speed (m/sec), assumed to be 5 m/sec. 1-hr concentrations were converted to 3-hr, 8-hr, 24-hr and annual concentrations using the following conversions, respectively: 0.9, 0.7, 0.4, 0.025.

N/A = Stack is not subject to cavity effects because it is located outside the 5L building zone of influence or the stack height is greater than the calculated GEP height.

calculation of cavity height, if the plume height is greater than the cavity height, it is assumed that maximum impacts will be dominated by wake effects rather than cavity effects. If the plume height is less than the cavity height and the distance between the stack and the building is less than the calculated cavity lengths, then concentrations within the cavity zone are further evaluated.

The cavity impact analysis for the FBG stack is summarized in Table 2-7 using both methods of calculating the height of the cavity zone. The analysis demonstrates that the plume height from the proposed stack will be greater than the cavity height calculated according to both procedures. Therefore, maximum impacts will be dominated by wake effects and no further analysis of cavity impacts for the FBG stack is required.

The cavity impact analyses for the emergency generator stack and cooling tower are summarized in Table 2-8 and Table 2-9, respectively. In these cases, the plume heights were less than the cavity heights. Therefore, cavity zone concentrations were estimated and compared to CTDEP adverse impact levels (1/8 the AAQS), SILs and AAQS. Based on these comparisons, cavity zone impacts due to emissions from the emergency generator and cooling tower were determined to be insignificant or acceptable.

It also should be noted that the PRIME downwash algorithm was used in conjunction with the ISCST3 model in the screening and refined modeling analyses. The PRIME algorithm partitions plume mass between the cavity recirculation region and the dispersion enhanced wake region based upon the fraction of plume mass that is calculated to intercept the cavity boundaries. The inclusion of the cavity predictions within ISC-PRIME removes a modeling discontinuity that exists when ISC is used without the PRIME algorithm and obviates the need for additional cavity impact analysis using the SCREEN3 or other calculation procedures.[2 3] Regardless, the more conservative cavity impact calculation procedures were performed as use of the PRIME algorithm is not specifically referenced in the outdated CTDEP AIAG.

2.4 Urban/Rural Designation

The selection of urban or rural designation for screening and refined modeling input was based on the land use classification procedure referenced in the AIAG. The area circumscribed by a 3 kilometer radius circle centered about the PRE source is depicted on the USGS topographical map in Figure 2-1. In making the urban/rural determinations, areas on the topographic map shaded pink and purple are considered urban and areas shaded green are considered rural. Areas shaded white were classified according to Auer land use categories based on a review of aerial photography shown in Figure 2-2. From inspection of the USGS topographical map and aerial photograph, the areas within the 3 kilometer radius circle considered to be urban land uses (i.e., in Auer land use categories I1, I2, C1, R2 or R3) were estimated to be less than 25 percent. Therefore, the land use classification of the modeling domain is considered rural (i.e., less than 50 percent urban areas) and the modeling was performed using rural dispersion coefficients.

Figure 2-1 – USGS Topographic Map Showing 3 KM Radius Land Use

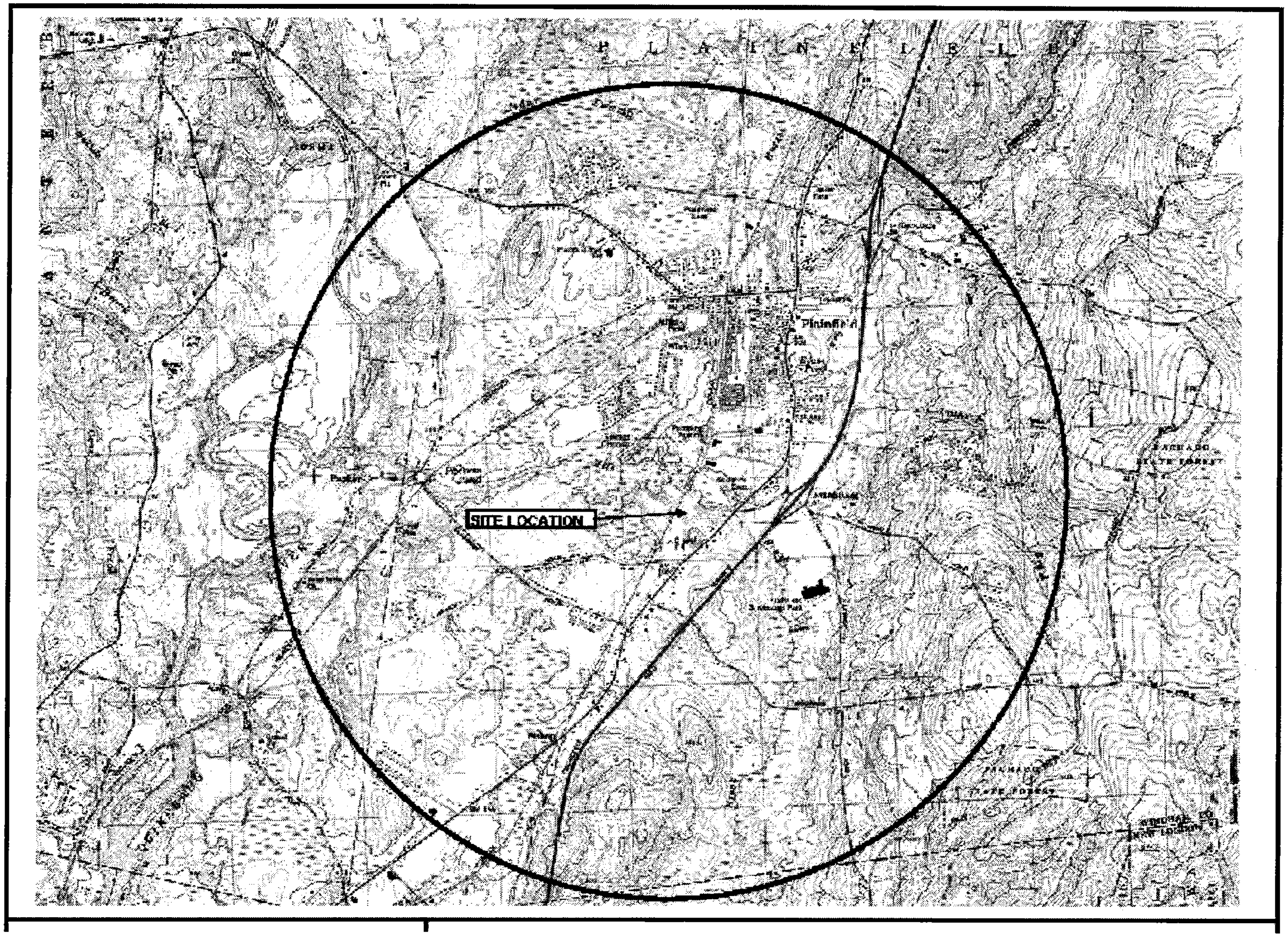
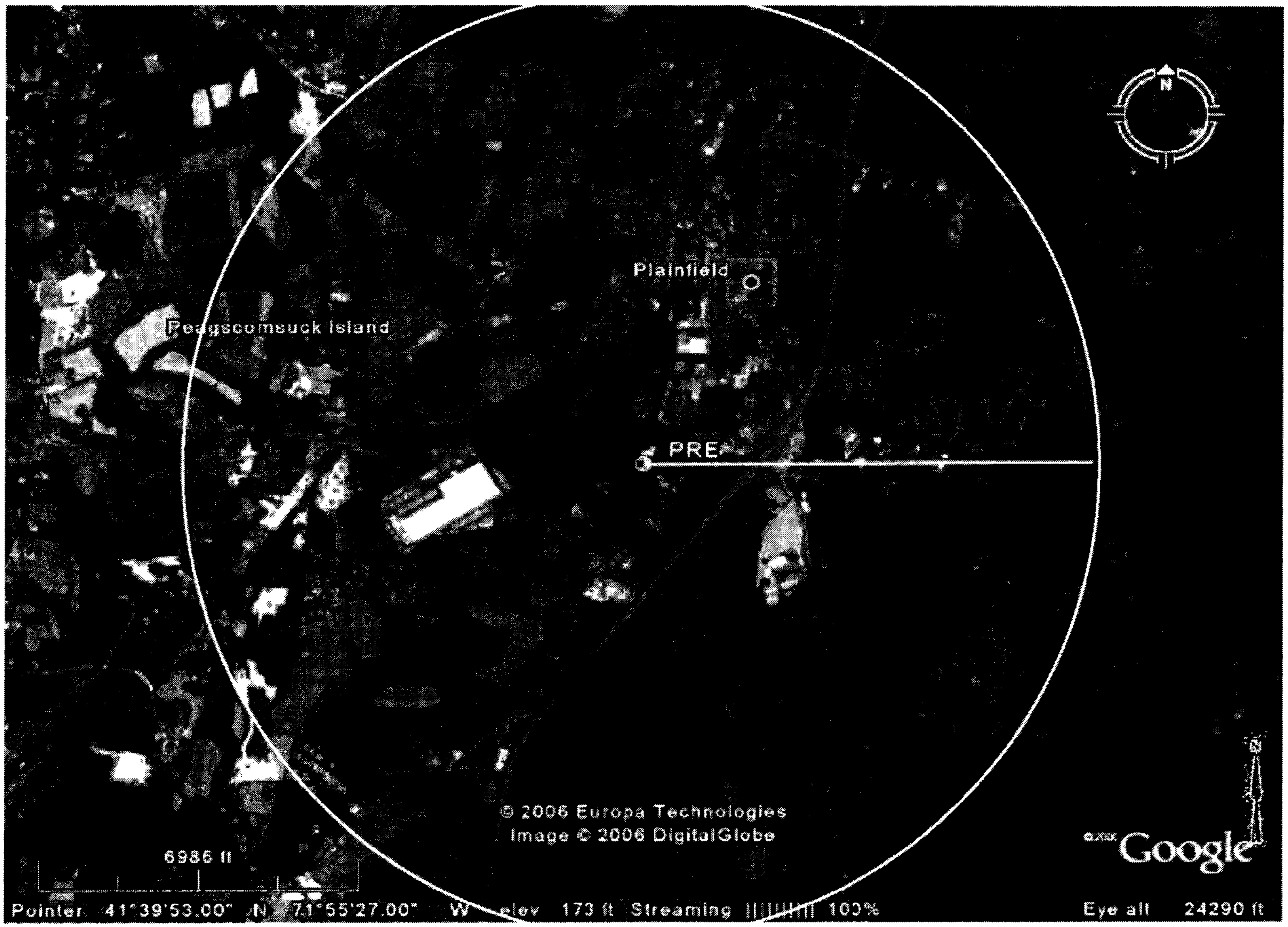


Figure 2-2 – 3 KM Radius Aerial Photograph



3.0 SCREENING MODELING ANALYSIS

Screening modeling was performed with EPA's ISCST3 model (Version 02035 and also with Version 04269 with PRIME algorithm) to determine the worst case operating condition and receptor rings for subsequent refined modeling. The stack parameters corresponding to the four operating load conditions are summarized in Table 2-1. The modeled operating conditions correspond to the expected range of biomass fuel compositions and operating loads for the subject FBG power plant. The modeling was performed using the set of twenty meteorological conditions recommended for screening modeling in the AIAG. Initial runs were performed assuming flat terrain. Receptors were placed along a single wind direction radial at 100-meter intervals out to two kilometers, 500-meter intervals to ten kilometers and 1,000-meter intervals out to 20 kilometers. Because the FBG stack will be susceptible to downwash, an additional receptor was placed at a distance of 3L (94 meters) from the stack.

An additional run of the ISCST model was performed with the maximum terrain representing each receptor ring input to the model. Terrain elevations at each of the receptor points were specified by importing 7.5 minute USGS Digital Elevation Model (DEM) data obtained from www.webgis.com into the Lakes Environmental ISC-AERMOD View model, which was initially set up with a polar receptor grid at the receptor ring distances as specified above. Following the procedure in the AIAG, the method used to select the elevation for each receptor involved importing the highest elevation from within a bounding polygon, where the bounding polygon is defined by half the distance to adjacent receptor grid nodes. Once the terrain elevations were specified for the polar receptor grid, the maximum elevation for each receptor ring was determined and then input to the receptors set up along a single wind direction radial for the screening modeling. Table 3-1 summarizes the screening receptors with terrain data specified in this manner.

A final screening run was performed using the ISCST model with PRIME algorithm (Version 04269) and the receptor terrain data as described above.

The following model options were used for the ISCST3 screening modeling in accordance with the AIAG:

- Rural mode
- Gradual plume rise
- Stack-tip downwash
- Buoyancy-induced dispersion
- Calms processing routine
- No missing data processing routine
- Default wind profile exponents
- Default vertical potential temperature gradients

The ISCST screening model outputs are summarized in Table 3-2. The screening modeling results show that the maximum PM_{10}, NO_2, SO_2 and Pb impacts occur for Case 2 (the 25/75 C&D/Wood @ 100 percent load case) and the maximum CO impact occurs for Case 1 (the 100%

Table 3-1 – Summary of Terrain Data For Screening Modeling

Stack base elevation (m) = 56
Stack Height (m) = 47.24
ORIG (UTM, XY) 756,096 m 4,616,897 m (Datum NAD27, Zone 18)

Receptor Distance (m)	Terrain Height Above MSL (m)	Terrain Height[a] (m)	Complex Terrain[a] (m)
94	59	3	
100	59	3	
200	61	5	
300	66	10	
400	61	5	
500	63	7	
600	66	10	
700	69	13	
800	71	15	
900	72	16	
1000	68	12	
1100	69	13	
1200	73	17	
1300	72	16	
1400	80	24	
1500	87	31	
1600	91	35	
1700	98	42	
1800	102	46	
1900	108	52	52
2000	117	61	61
2500	151	95	95
3000	162	106	106
3500	179	123	123
4000	175	119	119
4500	177	121	121
5000	167	111	111
5500	176	120	120
6000	196	140	140
6500	191	135	135
7000	195	139	139
7500	168	112	112
8000	165	109	109
8500	178	122	122
9000	181	125	125
9500	174	118	118
10000	184	128	128
11000	188	132	132
12000	208	152	152
13000	220	164	164
14000	190	134	134
15000	217	161	161
16000	216	160	160
17000	230	174	174
18000	197	141	141
19000	217	161	161
20000	222	166	166

[a] The terrain height and the stack height are expressed as heights above stack base elevation (56 m above mean sea level).

Table 3-2 – ISCST Screening Modeling Results

(Normalized Impacts for FBG Stack Based on 1 g/sec Emission Rate)
Controlling Building/Tier: BLD_1 Tier 4, Power House (Boiler Bldg.)

Flat Terrain Screening Model Results (ISCST3):

Case	1	2	3	4
Description	**100/0 C&D/Wood**	**25/75 C&D/Wood**	**65/35 C&D/Wood**	**25/75 C&D/Wood**
Simple Terrain Max. Conc. (1-hr. avg.), ($\mu g/m^3$)/(g/sec)	7.461	**7.529**	7.233	9.742
PM_{10} ($\mu g/m^3$)	9.34	**10.03**	9.06	9.50
NO_2 ($\mu g/m^3$)	33.50	**36.48**	33.75	35.58
SO_2 ($\mu g/m^3$)	15.81	**17.61**	15.52	17.17
CO ($\mu g/m^3$)	**46.98**	46.84	45.37	46.02
Pb ($\mu g/m^3$)	0.063	**0.069**	0.063	0.068

Elevated Terrain Screening Model Results (ISCST3):

Case	1	2	3	4
Description	**100/0 C&D/Wood**	**25/75 C&D/Wood**	**65/35 C&D/Wood**	**25/75 C&D/Wood**
Max. Conc. (1-hr. avg.), ($\mu g/m^3$)/(g/sec)	12.387	**12.468**	12.080	14.913
PM_{10} ($\mu g/m^3$)	15.51	**16.60**	15.13	14.54
NO_2 ($\mu g/m^3$)	55.62	**60.40**	56.36	54.47
SO_2 ($\mu g/m^3$)	26.25	**29.16**	25.92	26.29
CO ($\mu g/m^3$)	**78.01**	77.57	75.77	70.44
Pb ($\mu g/m^3$)	0.104	**0.115**	0.105	0.104

Elevated Terrain Screening Model Results (ISCST3 w/ PRIME):

Case	1	2	3	4
Description	**100/0 C&D/Wood**	**25/75 C&D/Wood**	**65/35 C&D/Wood**	**25/75 C&D/Wood**
Max. Conc. (1-hr. avg.), ($\mu g/m^3$)/(g/sec)	8.873	**8.921**	8.660	10.580
PM_{10} ($\mu g/m^3$)	11.11	**11.88**	10.85	10.32
NO_2 ($\mu g/m^3$)	39.84	**43.22**	40.40	38.65
SO_2 ($\mu g/m^3$)	18.80	**20.86**	18.58	18.65
CO ($\mu g/m^3$)	**55.88**	55.50	54.32	49.98
Pb ($\mu g/m^3$)	0.075	**0.082**	0.076	0.074

C&D @ 91 percent load case). Therefore, the refined modeling was performed using these different operating scenarios for the respective pollutants.

4.0 REFINED SINGLE-SOURCE MODELING ANALYSIS

4.1 Models Used

ISCST3 with PRIME algorithm (Version 04269) was used in the refined modeling analyses for both simple and complex terrain. The ISC model was run using the Lakes Environmental's ISC-AERMOD View (version 5.4.0) interface for EPA's ISC and AERMOD models. The PTMTPA-CONN model (modified 3/16/88) was run for all receptors identified in the refined receptor network with complex terrain (higher than stack top).

4.2 Stack Parameters

Table 4-1 summarizes the refined modeling input parameters for the two modeling scenarios. Based on the screening modeling results, all refined modeling for PM_{10}, $PM_{2.5}$, NO_2, SO_2, Pb and Dioxins was performed using stack parameters for Case 2 and all CO modeling was performed using the stack parameters for Case 1.

4.3 Building Downwash – BPIP Model

Building downwash effects were evaluated in the refined modeling analysis using the EPA Building Profile Input Program (BPIP, dated 04274 – contained in Lakes Environmental ISC-AERMOD View interface, version 5.4.0). BPIP determines, in each of the 36 wind directions (10° sectors), which building or structure may produce the greatest downwash effects on a stack. The direction-specific dimensions produced by the BPIP model are imported into the ISCST3 refined modeling input.

The scaled PRE site plan CAD drawing, referenced to the UTM coordinate system (Zone 18, NAD27 datum), was first imported into the ISC-AERMOD View program. Using the geographical interface in ISC-AERMOD View, the stacks and significant buildings and structures previously identified by the GEP stack height analysis were located on the scaled CAD drawing to determine the geographical (UTM - NAD27) coordinates and the structures and tiers were input to the model. Figure 4-1 depicts the BPIP model setup and the BPIP output files are provided in Appendix B. A three-dimensional representation of the significant structures and tiers on site is also provided in Figure 4-2, as generated by the ISC-AERMOD View program. Figure 4-3 is a computer-generated conceptual rendering from a similar viewpoint based on the site plan and general arrangement drawings.

4.4 Receptor Network and Terrain Elevations

The receptor grid used for refined single-source modeling was based on the results of the screening modeling analysis and the procedure described in the AIAG. A non-uniform polar grid receptor network was set up in ISCST3 with the ISC-AERMOD View interface using rings of receptors spaced at 10 degree intervals on 36 radials originating at the stack location. The screening modeling analysis for both operating scenarios resulting in the maximum impacts indicated that 94 meters (3L) was the closest distance to a maximum impact for any stability condition. Therefore, the receptor rings were selected at distances starting at 94 meters and

Table 4-1 – Refined Single-Source Modeling Analysis Input Data

SOURCE INFORMATION:

Company Name:	Plainfield Renewable Energy LLC
Equipment Location Address:	Mill Brook Rd., Plainfield, CT
Equipment Description:	EPI Fluidized Bed Staged Gasifier Energy System

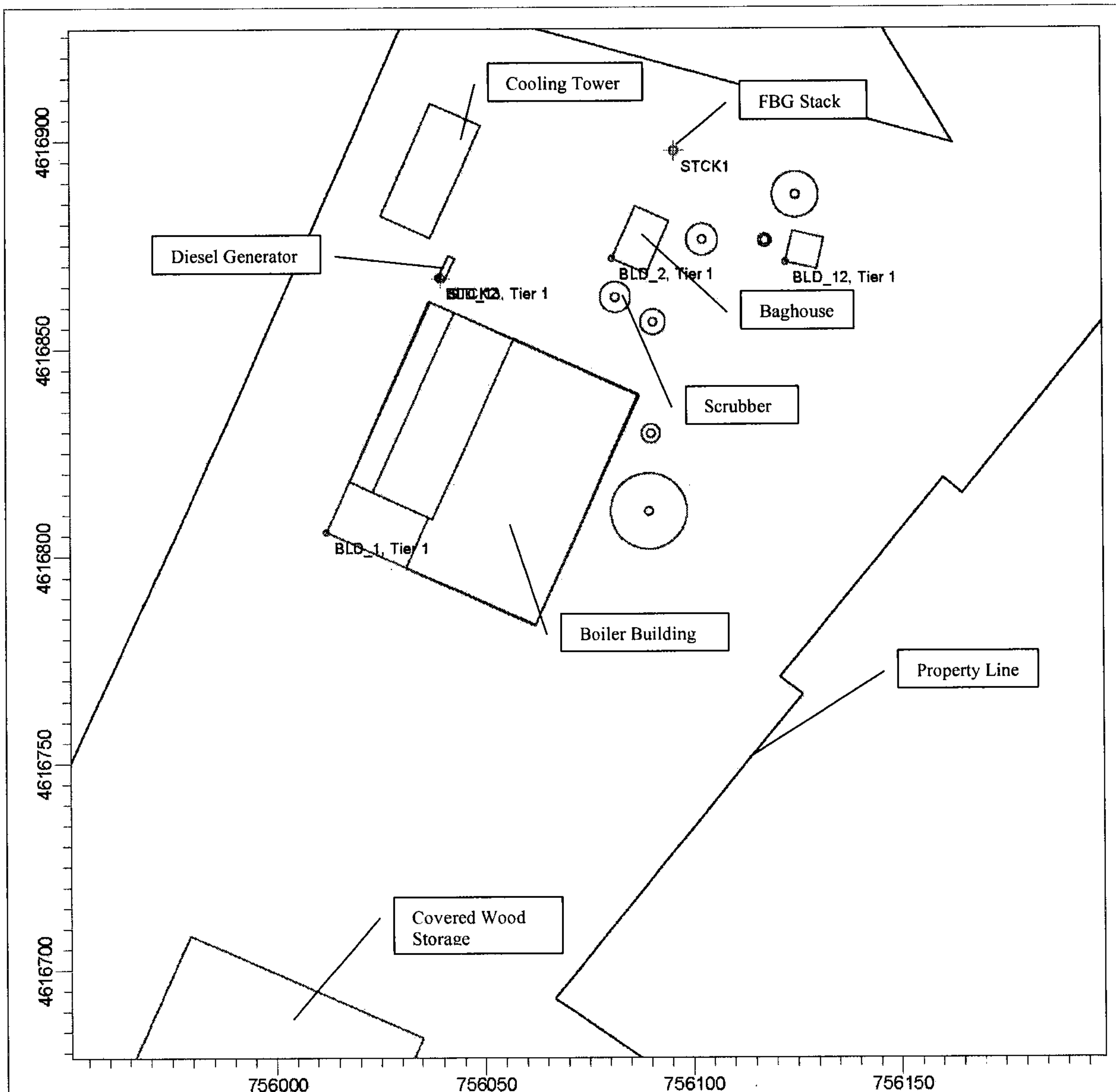
ORIG (UTM, XY), meters (FBG stack)	X =	756,096	meters East	Y=	4,616,897	meters North	(Datum NAD27, Zone 18)
	X =	256,549	meters East	Y=	4,616,457	meters North	(Datum NAD27, Zone 19)
Latitude/Longitude	N	41°39'53"		W	71°55'27"		
CT State Plane Coordinates	X =	825,679	feet East	Y=	303,960	feet North	(Datum NAD27)

OPERATING DATA AND STACK PARAMETERS:

Case	2				1			
Description	25/75 C&D/Wood				100/0 C&D/Wood			
% Load	100%				91%			
Exhaust Gas Flow Rate	3443	ft^3/sec	97.51	m^3/sec	3474	ft^3/sec	98.40	m^3/sec
Stack Exhaust Temp.	253	deg. F	395.93	deg. K	253	deg. F	395.93	deg. K
Physical Stack Height	155	ft.	47.24	m	155	ft.	47.24	m
Stack Height above MSL	332	ft.	101.24	m	332	ft.	47.24	m
Stack Diameter	9	ft.	2.74	m	9	ft.	2.74	m
Stack Velocity	54.12	ft/sec	16.50	m/sec	54.61	ft/sec	16.65	m/sec
Proposed Emission Rates (1-hour to 24-hour averages)[1]								
PM_{10}	10.46	lb/hr	1.32	g/sec	10.46	lb/hr	1.32	g/sec
NO_2	39.23	lb/hr	4.94	g/sec	39.23	lb/hr	4.94	g/sec
SO_2	18.56	lb/hr	2.34	g/sec	18.56	lb/hr	2.34	g/sec
CO	54.67	lb/hr	6.89	g/sec	54.67	lb/hr	6.89	g/sec
Pb	0.073	lb/hr	0.0092	g/sec	0.073	lb/hr	0.0092	g/sec
Dioxins	4.6E-08	lb/hr	5.7E-09	g/sec	4.6E-08	lb/hr	5.7E-09	g/sec
Proposed Emission Rates (annual averages)								
PM_{10}	45.82	TPY	1.32	g/sec	45.82	TPY	1.32	g/sec
NO_2	171.84	TPY	4.94	g/sec	171.84	TPY	4.94	g/sec
SO_2	81.29	TPY	2.34	g/sec	81.29	TPY	2.34	g/sec
CO	239.47	TPY	6.89	g/sec	239.47	TPY	6.89	g/sec
Pb	0.321	TPY	0.0092	g/sec	0.321	TPY	0.0092	g/sec
Dioxins	2.0E-07	TPY	5.7E-09	g/sec	2.0E-07	TPY	5.7E-09	g/sec

1. To ensure conservativeness of modeling results, maximum lb/hr emission rates of any operating load scenario were used in the modeling analysis.
2. Stack base elevation automatically obtained in Lakes ISC-AERMOD View from imported USGS DEM data differs slightly from base elevation assumed for screening modeling (i.e., 54 m obtained from DEM data versus 56 m used in screening modeling).

Figure 4-1 – BPIP Model Setup, Building/Structure Identification



COMMENTS: UTM coordinates referenced to Zone 18, NAD27	SOURCES: 7	COMPANY NAME: M.I. Holzman & Associates, LLC	
	RECEPTORS: 742	MODELER: Michael I. Holzman	
		SCALE: 1:1,513 0 ——— 0.05 km	
		DATE: 11/22/2006	PROJECT NO.: 085-001

ISC-AERMOD View - Lakes Environmental Software C:\MIHA Files\MIHA\Projects\(085)Decker Energy\(001)Plainfield Renewable Energy\Modeling\ISC\PRENOM70.isc

Figure 4-2 – BPIP Model Setup, 3D Building Representation

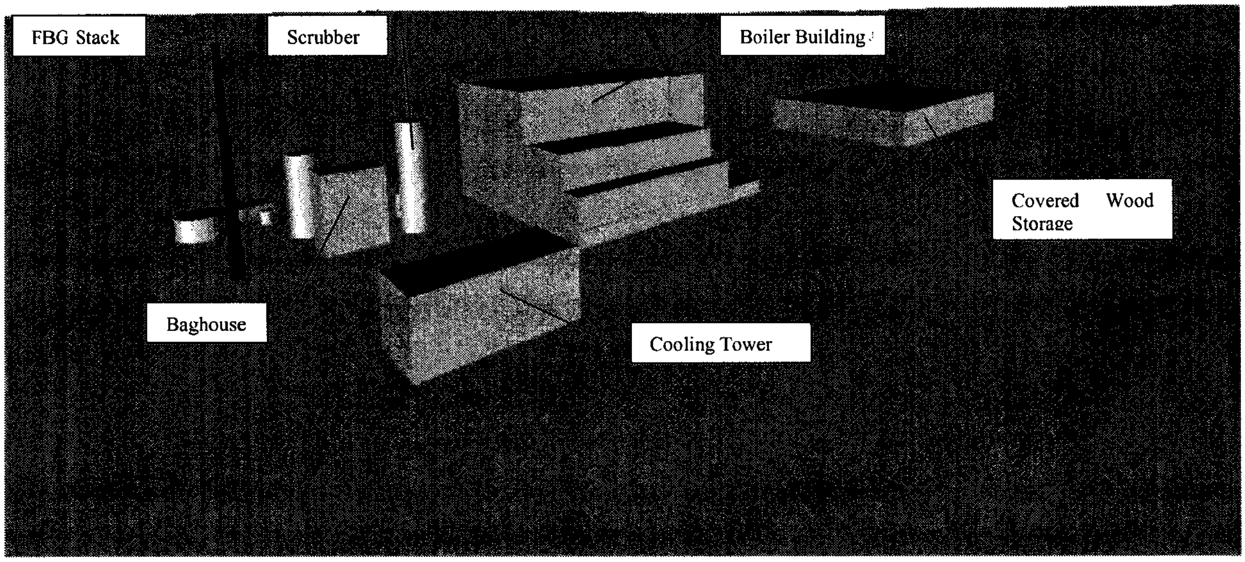
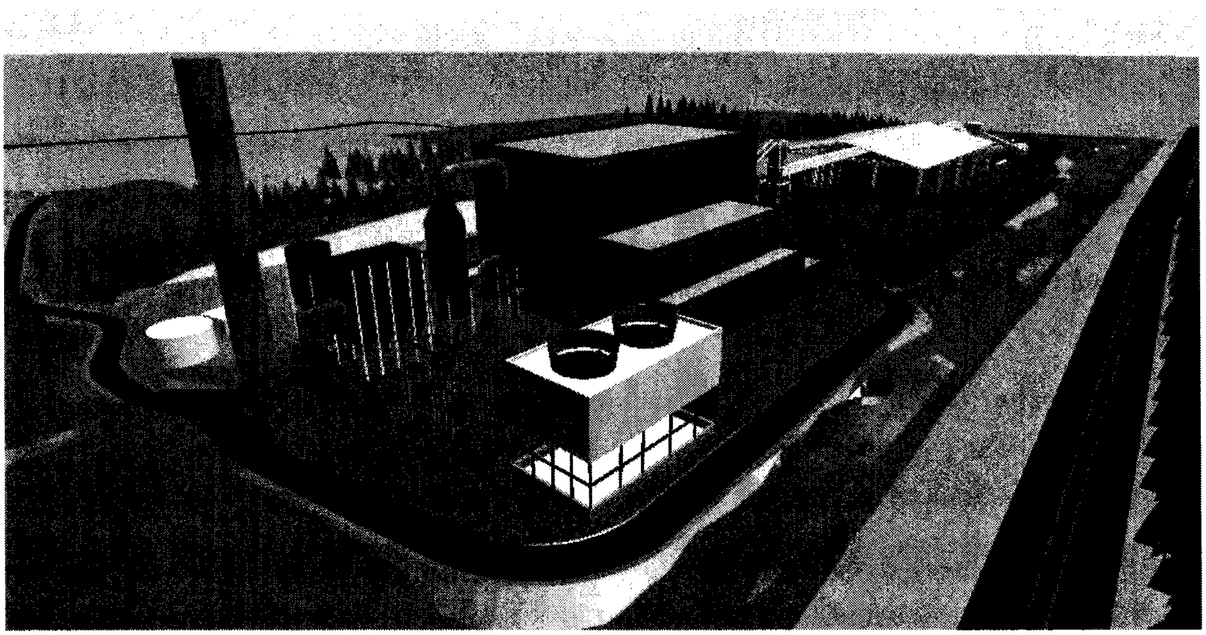


Figure 4-3 – Computer-Generated Conceptual Rendering



progressing geometrically by a factor of 1.33 (with minimum initial ring spacing of 100 meters) until the significant impact area could be defined. For initial refined modeling runs, a total of 19 receptor rings were defined at the following distances in meters from the stack: 94, 194, 260, 340, 450, 600, 800, 1060, 1410, 1880, 2500, 3320, 4410, 5860, 7790, 10360, 13780, 18330, and 24380 meters. In order to import terrain elevations associated with each of the receptors, the polar grid had to be converted into discrete Cartesian receptors.

The proposed site will be fenced and not accessible to the general public. Therefore, a total of 58 discrete receptors were placed along the proposed fenceline, including 23 receptors at each node of the fenceline polygon and 35 receptors at intermediate points between nodes. An additional 40 discrete receptors were defined 50 meters from the plant fenceline at 50 meter spacing. Discrete Cartesian receptors located within the plant boundary were eliminated since the property will not be accessible by the general public. Figure 4-4 depicts the near-field polar receptors, fenceline and plant boundary receptors with those within the plant boundary eliminated. Figure 4-5 depicts the entire receptor network within the modeling domain boundaries.

Terrain elevations at each of the receptor points were specified by importing 7.5 minute USGS Digital Elevation Model (DEM) data into ISC-AERMOD View. The DEM data was obtained from www.webgis.com. The ISC-AERMOD View program was able to import DEM data from different UTM zones by converting the UTM coordinates to a consistent zone and datum reference. UTM Zone 18 (NAD27) was used as the common reference for model setup. Following the procedure in the AIAG, the method used to select the elevation for each receptor involved importing the highest elevation from within a bounding polygon, where the bounding polygon is defined by half the distance to adjacent receptor grid nodes.

The receptor network for the PTMTPA-CONN complex terrain modeling was selected from the ISCST3 polar network based on the elevation of each receptor in relation to the FBG stack top. A total of 151 receptors were determined to have elevations at or above the proposed stack top. The UTM coordinates (referenced to zone 18, NAD27 datum) are summarized in Table 4-2. As required by the AIAG, these high terrain receptors were modeled using both the ISCST3 and PTMTPA-CONN models.

4.5 Meteorological Data

Following the AIAG and discussions with Mr. Jude Catalano of CTDEP's air quality modeling group, surface data from National Weather Service (NWS) Station #14740 (Bradley International Airport) and upper air data from NWS Station # 14735 (Albany County Airport), both for the years 1970 to 1974 were selected for input in the ISCST3 modeling analysis.

The set of 17 meteorological conditions listed in Table 5-3 of the AIAG was used for the PTMTPA-CONN modeling of complex terrain receptors.

4.6 Background Air Quality

Modeled pollutant concentrations are added to background air quality data to evaluate compliance with NAAQS/CAAQS. Background air quality data are conservatively used to account for pollutant concentrations that are otherwise not accounted for in the single-source or

Figure 4-4 – ISCST Model Setup, Showing Buildings, Fenceline, Plant Boundary and Near-Field Receptors

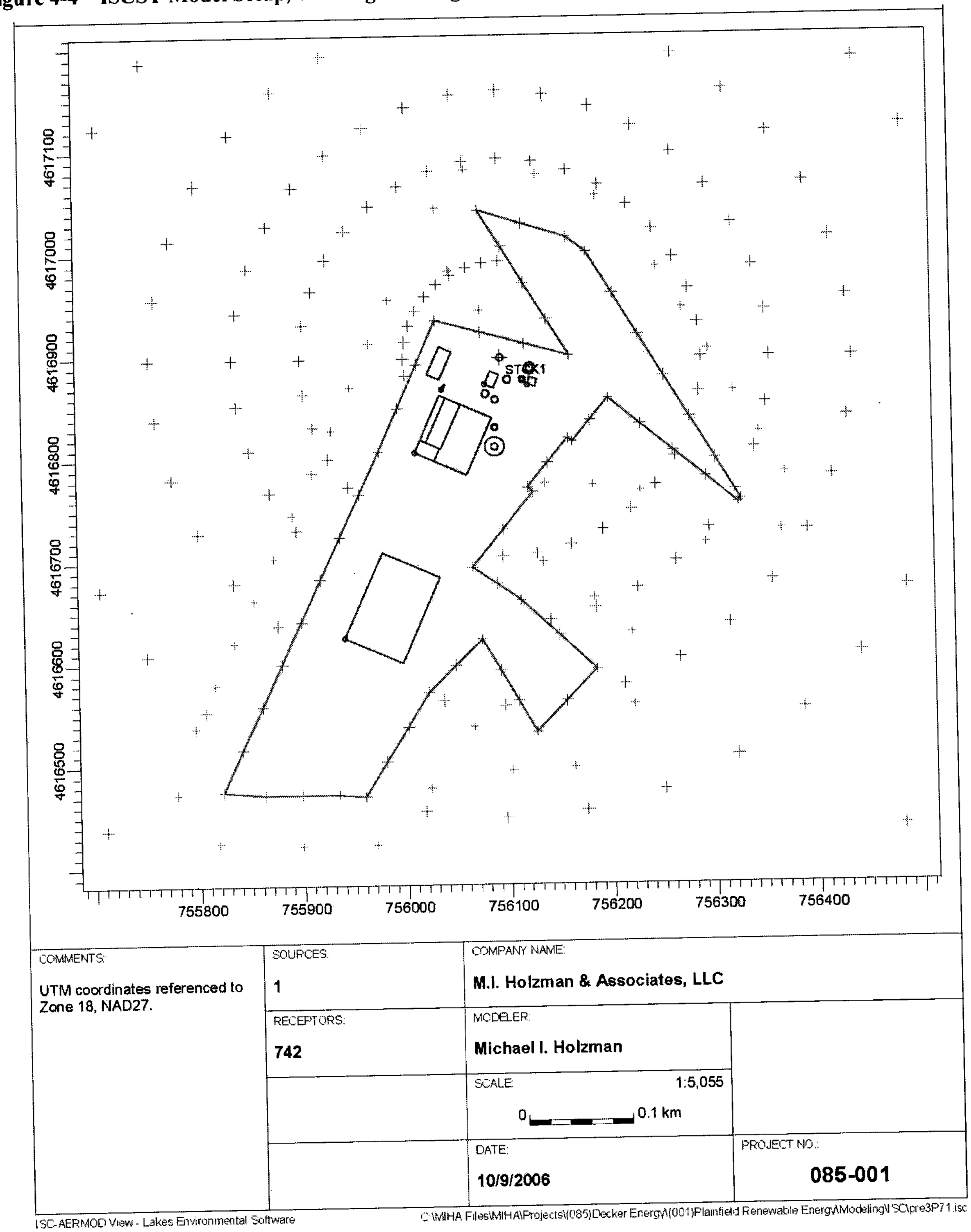
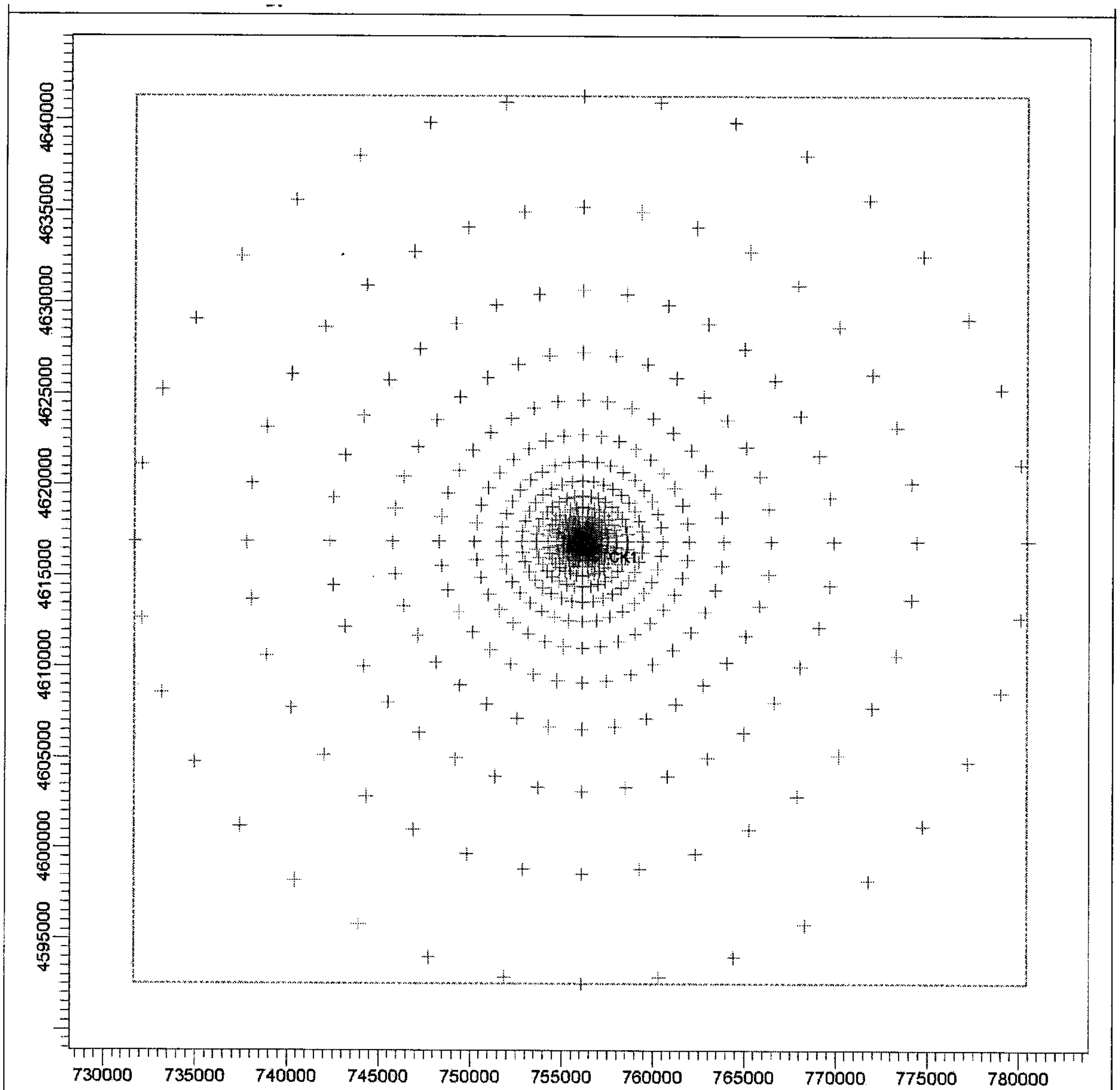


Figure 4-5 – ISCST Model Setup, Polar Receptors and Domain Boundaries



COMMENTS:	SOURCES:	COMPANY NAME:	
UTM coordinates referenced to Zone 18, NAD27.	1	M.I. Holzman & Associates, LLC	
	RECEPTORS: 742	MODELER: Michael I. Holzman	
		SCALE: 1:339,646 0 — 10 km	
		DATE: 10/9/2006	PROJECT NO.: 085-001

ISC-AERMOD View - Lakes Environmental Software   C:\MIHA Files\MIHA\Projects\(085)Decker Energy\(001)Plainfield Renewable Energy\Modeling\ISC\pre3P71.isc

Table 4-2 – PTMTPA Complex Terrain Receptors (Elevation Greater Than Stack Top)

UTM X (KM)	UTM Y (KM)	Z (M)	UTM X (KM)	UTM Y (KM)	Z (M)	UTM X (KM)	UTM Y (KM)	Z (M)
768.28624	4638.01118	216.2	759.41624	4616.89748	151.0	766.29885	4618.69648	121.0
743.90624	4638.01118	205.5	763.41645	4619.56182	150.1	768.03007	4610.00748	121.0
764.95385	4627.45357	204.0	758.2613	4615.64748	149.9	760.32978	4640.90709	120.8
746.93124	4632.77173	196.9	766.65233	4625.75509	149.9	750.91624	4625.8695	120.5
767.87854	4630.93907	195.1	769.87624	4616.89748	149.0	758.55826	4616.46336	120.2
747.75779	4639.80719	191.3	758.23029	4614.35421	147.2	760.80928	4603.94852	118.4
765.26124	4632.77173	191.0	759.3658	4616.32097	146.9	745.89363	4618.69648	116.7
762.98624	4628.83131	187.1	761.60284	4618.90172	146.2	744.16241	4623.78748	116.5
761.95624	4616.89748	185.0	758.97144	4615.23748	146.0	780.10585	4621.13102	115.9
740.22199	4626.06248	179.9	759.4745	4619.73217	145.6	758.59624	4616.89748	115.8
773.32081	4623.16671	177.3	737.42008	4632.56864	145.4	737.42008	4601.22632	115.7
742.05465	4628.67978	176.5	760.24028	4618.40579	145.0	764.03246	4623.55676	115.0
770.13783	4628.67978	176.1	780.10585	4612.66394	144.6	743.14728	4621.61052	114.9
761.86721	4615.8799	175.1	761.27624	4625.8695	144.3	760.80928	4629.84644	114.7
761.60284	4614.89324	175.1	765.06826	4622.07748	144.2	761.17115	4619.82748	114.7
758.93093	4613.51922	175.0	759.21602	4615.76197	144.2	780.47624	4616.89748	114.3
747.12422	4622.07748	175.0	758.30124	4613.07831	144.1	762.36547	4634.12205	114.0
761.86721	4617.91506	174.8	768.03007	4623.78748	143.7	748.77603	4614.23314	113.7
759.4745	4614.06279	174.7	748.16002	4623.55676	142.7	745.89363	4615.09848	113.6
764.43469	4639.80719	172.1	759.91541	4619.10248	142.4	758.44547	4617.75253	113.1
759.3658	4617.47399	172.0	758.97144	4618.55748	141.7	760.58526	4613.13074	113.1
762.06373	4621.9048	171.7	771.7674	4635.57364	141.3	756.09624	4635.22748	111.2
760.43924	4617.66327	171.6	766.45624	4616.89748	141.1	765.06826	4611.71748	111.0
740.42508	4635.57364	171.0	758.01135	4615.29051	137.9	751.08892	4622.86497	111.0
751.8627	4640.90709	170.7	758.44547	4616.04243	136.0	748.42459	4618.2502	110.7
779.00595	4608.55903	170.6	748.77603	4619.56182	133.9	756.09624	4598.56748	110.3
777.20994	4629.08748	169.9	731.71624	4616.89748	133.8	764.03246	4610.2382	110.0
774.42624	4616.89748	169.2	758.55826	4617.3316	132.6	758.2613	4618.14748	109.8
771.97049	4626.06248	168.7	765.26124	4601.02323	132.2	759.63957	4626.6327	109.7
762.75552	4624.8337	167.4	740.22199	4607.73248	132.0	757.60455	4612.75344	109.4
746.36102	4620.44081	167.2	763.76789	4615.54476	131.1	759.27921	4598.84595	109.4
760.50624	4616.89748	165.7	762.06373	4611.89016	131.0	757.23175	4620.01726	108.6
760.24028	4615.38917	165.4	758.10048	4611.39088	130.8	757.75624	4614.02228	108.3
759.91541	4614.69248	162.3	757.75624	4619.77268	130.4	765.83146	4620.44081	108.0
749.20624	4628.83131	161.9	766.29885	4615.09848	130.1	734.98254	4604.70748	107.8
758.63951	4614.76343	161.4	769.66689	4614.50461	130.0	756.09624	4592.51748	107.1
761.17115	4613.96748	159.9	757.70321	4614.98237	129.9	756.09624	4603.11748	106.6
774.14777	4620.08045	159.2	760.58526	4620.66422	129.3	734.98254	4629.08748	106.2
763.76789	4618.2502	158.9	771.97049	4607.73248	129.2	765.83146	4613.35415	106.1
760.43924	4616.13169	158.7	732.08663	4612.66394	129.1	757.86286	4616.25448	105.8
752.91327	4634.94901	158.5	759.86298	4612.40846	127.7	758.76058	4609.57727	105.5
759.02624	4611.82257	158.3	767.87854	4602.85589	126.1	750.32527	4617.91506	105.0
759.21602	4618.03299	157.8	762.36547	4599.67291	125.4	770.13783	4605.11518	105.0
747.23863	4627.45357	157.5	752.20124	4623.64382	125.3	748.30624	4616.89748	104.8
762.84258	4620.79248	156.1	769.66689	4619.29035	124.1	757.94768	4616.57102	104.6
763.88624	4616.89748	154.6	769.0452	4621.61052	123.6	757.97624	4616.89748	104.5
744.31394	4630.93907	154.0	745.73624	4616.89748	123.5	774.7724	4632.56864	104.2
762.84258	4613.00248	153.9	764.95385	4606.34139	123.3	758.63951	4619.03153	104.1
738.04471	4613.71451	153.2	758.30124	4620.71665	122.5	754.29724	4606.69487	103.7
763.41645	4614.23314	152.9	759.99124	4610.15114	121.3	749.3499	4613.00248	103.3
						745.54015	4625.75509	103.3

multiple-source modeling analyses. With exceptions noted as follows, background concentrations were obtained in accordance with the procedure in the AIAG from the average of the most recent available three years of monitoring data (2003-2005) from the three Connecticut monitoring sites nearest to the project site. For $PM_{2.5}$, background concentrations were obtained from the average of 2003-2005 data from the Norwich, CT and East Greenwich, RI monitoring sites as these sites were judged to be most representative of the rural location of the PRE site. Similarly, for PM_{10}, the 24-hour background concentration was obtained from the average of the 2003-2005 values from East Hartford, CT and East Greenwich, RI. The PM_{10} annual background concentration was obtained from the average of the 2003-2005 values from Waterbury, CT and East Greenwich, RI. Table 4-3 summarizes the background ambient data determined to be most representative of the PRE modeling domain.

Table 4-3 – Representative Ambient Background Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	AAQS ($\mu g/m^3$)	Basis
PM10	24-hour	31	150	3
	Annual	17	50	4
PM2.5	24-hour	33	65	2
	Annual	9.8	15	2
NO_2	Annual	33	100	1
SO_2	3-hour	92	1300	1
	24-hour	55	260	1
	Annual	11	60	1
CO	1-hour	20,000	40,000	5
	8-hour	5,000	10,000	5
Pb	3-month		1.5	6
Dioxins	Annual		1.00E-06	6

1. Background concentrations were obtained from the 2003-2005 average values from the 3 CT monitoring sites nearest to the project site (data provided by CTDEP).
2. For PM2.5, background concentrations were obtained from the average of 2003-2005 data from the Norwich, CT and East Greenwich, RI monitoring sites.
3. For PM10, the 24-hour background concentration was obtained from the average of the 2003-2005 values from East Hartford, CT and E. Greenwich, RI.
4. The PM10 annual background concentration was obtained from the average of the 2003-2005 values from Waterbury,CT and E. Greenwich, RI.
5. For CO, the background concentrations were set equal to half the applicable AAQS.
6. No monitoring data available.

4.7 Other Modeling Options

The ISC control options used in the modeling analysis were consistent with the recommendations in the AIAG:

- Rural mode
- Gradual plume rise
- Stack-tip downwash
- Buoyancy-induced dispersion
- Calms processing routine
- No missing data processing routine
- Default wind profile exponents
- Default vertical potential temperature gradients

The PTMPTA-CONN control options used in the modeling analysis were consistent with the recommendations in the AIAG:

- Printing of partial concentrations (KNTRL=1) *(background set to 0)*
- Plane displacement and "STREAMFLOW" (KTOP=1)
- Exponential increase of wind speed with height (KU=1)
- Inputs in metric units (NGLISH=0)
- Buoyancy induced dispersion (IBID=1)
- Rural dispersion coefficients (IRURB=1)

4.8 Modeling Results and Determination of Significant Impact Area

Unit emission rates (1 g/sec) from the FBG stack were modeled using the ISCST3 and PTMTPA models for both operating scenarios predicted by the screening modeling to result in maximum impacts (i.e., Case 2 for PM_{10}, NO_2, SO_2, Pb and Dioxins, and Case 1 for CO). The modeled normalized impacts [($\mu g/m^3$)/(g/sec)] for each applicable averaging period determined with each model and operating scenario are summarized in Table 4-4. The maximum normalized impacts were then multiplied by the respective g/sec emission rates for each pollutant being evaluated to calculate the maximum modeled pollutant impacts. For ISCST model results, highest second high modeled concentrations were used to evaluate all short-term impacts (1-hour to 24-hour) and highest modeled concentrations were used to evaluate annual impacts. For PTMTPA model results, the maximum modeled results from all receptors were used to evaluate impacts for each averaging period.

Table 4-4 – ISCST and PTMTPA Single-Source Normalized (1 g/sec) Impacts

Operating Scenario 2 for PM10, PM2.5, NO2, SO2, Pb and Dioxins Impacts:

	ISCST Normalized Impacts ($\mu g/m^3$)/(g/sec) [1]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974	Max.	Max. Year	East (m)	North (m)		
1-hour average	7.47	8.28	7.84	6.91	9.22	9.22	1974	758,261.3	4,618,147.5	2500	60
3-hour average	4.17	4.26	4.13	4.05	4.28	4.28	1974	759,365.8	4,617,474.0	3320	80
8-hour average	2.14	2.36	2.89	2.77	2.10	2.89	1972	758,261.3	4,615,647.5	2500	120
24-hour average	1.24	1.12	1.36	1.30	1.01	1.36	1972	758,261.3	4,615,647.5	2500	120
Annual average	0.21	0.22	0.19	0.20	0.18	0.22	1971	758,261.3	4,615,647.5	2500	120

	PTMTPA Normalized Impacts at Complex Terrain Receptors ($\mu g/m^3$) [1,2]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	Recept. 1 - 30	Recept. 31-60	Recept. 61-90	Recept. 91-120	Recept. 121-150	Recept. 1 51	Max.	East (m)	North (m)		
1-hour average	15.6	21.1	16.7	8.9	4.4	1.1	21.1	758,261.3	4,615,647.5	2500	120
3-hour average	14.0	19.0	15.0	8.0	4.0	1.0	19.0	758,261.3	4,615,647.5	2500	120
8-hour average	10.9	14.8	11.7	6.2	3.1	0.8	14.8	758,261.3	4,615,647.5	2500	120
24-hour average	3.0	3.0	3.0	2.0	2.0	0.0	3.0	758,261.3	4,615,647.5	2500	120
Annual average	0.8	0.8	0.8	0.5	0.5	0.0	0.8	758,261.3	4,615,647.5	2500	120

Alternate receptor locations of maximum 24-hour and annual PTMTPA impacts:	759,216.0	4,618,033.0	3320	70
	758,640.0	4,614,763.0	3321	130

Operating Scenario 1 for CO Impacts:

	ISCST Normalized Impacts ($\mu g/m^3$)/(g/sec) [1]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	1970	1971	1972	1973	1974	Max.	Max. Year	East (m)	North (m)		
1-hour average	7.41	8.23	7.78	6.90	9.16	9.16	1974	758,261.3	4,618,147.5	2500	60
8-hour average	2.13	2.36	2.88	2.76	2.09	2.88	1972	758,261.3	4,615,647.5	2500	120

	PTMTPA Normalized Impacts at Complex Terrain Receptors ($\mu g/m^3$) [1,2]							UTM Coordinates		Distance from Stack (m)	Azimuth, degrees from N.
	Recept. 1 - 30	Recept. 31-60	Recept. 61-90	Recept. 91-120	Recept. 121-150	Recept. 1 51	Max.	East (m)	North (m)		
1-hour average	15.6	21.1	16.7	8.9	4.4	1.1	21.1	758,261.3	4,615,647.5	2500	120
8-hour average	10.9	14.8	11.7	6.2	3.1	0.8	14.8	758,261.3	4,615,647.5	2500	120

Table 4-4 (Continued)

Notes:

1. For ISCST model results, highest second high modeled concentrations were used to evaluate all short-term impacts (1-hour to 24-hour). Highest modeled concentrations were used to evaluate annual impacts.
2. PTMTPA-CONN provides maximum 3-hour and 24-hour concentrations for each receptor modeled. 1-hour and 8-hour concentrations were calculated by dividing the 3-hour value by 0.9 to calculate a 1-hour average, and then multiplying the 1-hour value by 0.7 to calculate an 8-hour average. Annual average concentrations were estimated by multiplying the maximum 24-hour concentration by 0.25 (the maximum ratio of the annual to 24-hr second high concentrations modeled with ISCST was 0.2 at the maximum PTMTPA impact receptor). Maximum modeled results from all receptors were used to evaluate impacts for each averaging period.

Table 4-5 summarizes the modeling results for each pollutant for comparison to applicable Significant Impact Levels (SILs), Pre-Construction Monitoring De Minimis Levels, Class II Area Allowable PSD Increments[b] and NAAQS/CAAQS. All pollutant impacts predicted by the ISCST model are less than the applicable Pre-Construction Monitoring De Minimis Levels, PSD Increments and AAQS/CAAQS. The ISCST modeling results also show that annual NO_2 impacts are predicted to be above the SIL that triggers multiple-source modeling requirements out to a distance of 2,830 meters from the stack. ISCST-predicted impacts for all other pollutants are less than the applicable SILs.

As summarized in Table 4-5, all pollutant impacts predicted by the PTMTPA model at receptors with terrain elevations above stack top were less than the applicable Pre-Construction Monitoring De Minimis Levels, PSD Increments and NAAQS/CAAQS. The PTMTPA model results also show that NO_2 and SO_2 impacts for all applicable averaging periods are predicted to exceed the SILs. For $PM_{2.5}$, although SILs have not yet been promulgated, they were estimated based on the same ratio of SILs to AAQS used for PM_{10} (i.e., 2 $\mu g/m^3$ and 0.3 $\mu g/m^3$, respectively, were estimated for the 24-hour and annual average $PM_{2.5}$ SILs). Based on use of these estimated values, $PM_{2.5}$ impacts were also predicted by the PTMTPA model to exceed the SILs. All other pollutant impacts predicted by the PTMPTA model were less than applicable SILs.

In summary, based on the results of the ISCST and PTMTPA single-source modeling, multiple-source modeling is required to be performed for the following pollutants and significant impact distances to demonstrate compliance with PSD Increments and NAAQS/CAAQS:

Pollutant	Maximum Significant Impact Radius (meters)
$PM_{2.5}$	10,360
NO_2	10,360
SO_2	10,360

[b] Plainfield is in a Class II Area and is more than 100 km from the closest Class I PSD Area in the northeastern part of the U.S. (Lye Brook in southern Vermont, located approximately 185 km northwest of Plainfield).

Table 4-5 – ISCST and PTMTPA Refined Single-Source Modeling Results

ISCST Modeled Impacts

Pollutant	Averaging Period	Max. Norm. $(\mu g/m^3)/(g/sec)^1$	Max. Impact $(\mu g/m^3)^{1,4}$	Signif. Impact Level $(\mu g/m^3)^5$	Signif. Impact Radius (m)	Pre-const. Monitoring De Minimis Levels $(\mu g/m^3)$	Class II Allowable PSD Increments. $(\mu g/m^3)$	Background Conc. $(\mu g/m^3)^6$	Total Conc. $(\mu g/m^3)$	Ambient Standard $(\mu g/m^3)$	Receptor Location of Maximum Impact: UTM East (m)	UTM North (m)	Distance from Stack (m)	Azimuth, degrees from N.
PM10	24-hour average	1.4	1.8	5	N/A	10	30	31	32.6	150	758,261	4,615,648	2,500	120
	Annual average	0.2	0.3	1	N/A	N/A	17	17	16.9	50	758,261	4,615,648	2,500	120
PM2.5	24-hour average	1.4	1.8	2	N/A	N/A	N/A	33	34.9	65	758,261	4,615,648	2,500	120
	Annual average	0.2	0.29	0.3	N/A	N/A	N/A	9.8	10.1	15	758,261	4,615,648	2,500	120
NO_2	Annual average	0.2	1.1	1	2,830	14	25	33	33.8	100	758,261	4,615,648	2,500	120
SO_2	3-hour average	4.3	10.0	25	N/A	N/A	512	92	10.0	1300	759,366	4,617,474	3,320	80
	24-hour average	1.36	3.2	5	N/A	13	91	55	58.2	260	758,261	4,615,648	2,500	120
	Annual average	0.2	0.5	1	N/A	N/A	20	11	11.5	60	758,261	4,615,648	2,500	120
CO	1-hour average	9.22	64	2,000	N/A	N/A	N/A	20,000	20,064	40,000	758,261	4,618,148	2,500	60
	8-hour average	2.89	20	500	N/A	575	N/A	5,000	5,020	10,000	758,261	4,615,648	2,500	120
Pb	Quarterly average[2]	1.36	0.01	0.3	N/A	0.1	N/A		0.01	1.5	758,261	4,615,648	2,500	120
Dioxins	Annual average	0.22	1.3E-09	1.00E-07	N/A	N/A	N/A		1.3E-09	1.00E-06	758,261	4,615,648	2,500	120

PTMTPA-CONN Modeled Impacts

Pollutant	Averaging Period	Max. Norm. $(\mu g/m^3)/(g/sec)^{1,3}$	Max. Impact $(\mu g/m^3)^{3,4}$	Signif. Impact Level $(\mu g/m^3)^5$	Signif. Impact Radius (m)	Pre-const. Monitoring De Minimis Levels $(\mu g/m^3)$	Class II Allowable PSD Increments. $(\mu g/m^3)$	Background Conc. $(\mu g/m^3)^6$	Total Conc. $(\mu g/m^3)$	Ambient Standard $(\mu g/m^3)$	Receptor Location of Maximum Impact: UTM East (m)	UTM North (m)	Distance from Stack (m)	Azimuth, degrees from N.
PM_{10}	24-hour average	3.0	4.0	5	N/A	10	30	31	34.8	150	758,261	4,615,648	2500	120
	Annual average	0.8	0.99	1	N/A	N/A	17	17	17.6	50	758,261	4,615,648	2500	120
PM2.5	24-hour average	3.0	4.0	2	10,360	N/A	N/A	33	37.1	65	758,261	4,615,648	2500	120
	Annual average	0.8	0.99	0.3	10,360	N/A	N/A	9.8	10.8	15	758,261	4,615,648	2500	120
NO_2	Annual average	0.8	3.7	1	10,360	14	25	33	36.4	100	758,261	4,615,648	2500	120
SO_2	3-hour average	19.0	44	25	4,410	N/A	512	92	44.4	1300	758,261	4,615,648	2500	120
	24-hour average	3.0	7.0	5	4,410	13	91	55	62.0	260	758,261	4,615,648	2500	120
	Annual average	0.8	1.8	1	10,360	N/A	20	11	12.8	60	758,261	4,615,648	2500	120
CO	1-hour average	21.1	145	2,000	N/A	N/A	N/A	20,000	20,145	40,000	758,261	4,615,648	2500	120
	8-hour average	14.8	102	500	N/A	575	N/A	5,000	5,102	10,000	758,261	4,615,648	2500	120
Pb	Quarterly average[2]	3.0	0.03	0.3	N/A	0.1	N/A		0.03	1.5	758,261	4,615,648	2500	120
Dioxins	Annual average	0.8	4.3E-09	1.00E-07	N/A	N/A	N/A		4.3E-09	1.00E-06	758,261	4,615,648	2500	120

Table 4-5 (Continued)

Notes:

1. For ISCST model results, highest second high modeled concentrations were used to evaluate all short-term impacts (1-hour to 24-hour). Highest modeled concentrations were used to evaluate annual impacts.
2. Lead impacts were conservatively determined using 24-hour impacts.
3. PTMTPA-CONN provides maximum 3-hour and 24-hour concentrations for each receptor modeled. 1-hour and 8-hour concentrations were calculated by dividing the 3-hour value by 0.9 to calculate a 1-hour average, and then multiplying the 1-hour value by 0.7 to calculate an 8-hour average. Annual average concentrations were estimated by multiplying the maximum 24-hour concentration by 0.25 (the maximum ratio of the annual to 24-hr second high concentration modeled with ISCST was 0.2 at the maximum PTMTPA impact receptor). Maximum modeled results from all receptors were used to evaluate impacts for each averaging period.
4. Maximum impacts calculated by multiplying normalized impacts (μg/m3)/(g/sec) by the respective maximum g/sec emission rates (for any operating scenario) for each pollutant and applicable averaging period.
5. Significant Impact Levels (SIL) for PM2.5 are estimated, based on same ratio of SIL to AAQS for PM10.

			Significant Impact Radius (meters)						
Pollutant	**Averaging Period**	**Normalized PTMTPA impacts that correspond to significant impacts[1]**	**Recept. 1 - 30**	**Recept. 31-60**	**Recept. 61-90**	**Recept. 91-120**	**Recept. 121-150**	**Recept. 151**	**Max.**
PM2.5	24-hour average	1.52	10,360	10,360	10,360	10,360	7,790	0	10,360
PM2.5	Annual average (24-hr)	0.91	10,360	10,360	10,360	10,360	7,790	0	10,360
NO2	Annual average (24-hr)	0.81	10,360	10,360	10,360	10,360	7,790	0	10,360
SO2	3-hour average	10.69	4,410	4,410	4,410	0	0	0	4,410
SO2	24-hour average	2.14	4,410	4,410	4,410	2,500	1,880	0	4,410
SO2	Annual average (24-hr)	1.71	10,360	10,360	10,360	10,360	7,790	0	10,360

1 Equivalent normalized impacts corresponding to significant impacts for annual averages were calculated by dividing the annual averages by 0.25.

4.9 Pre-Construction Monitoring Waiver Request

Table 4-5 also compares maximum ISCST- and PTMTPA-modeled impacts to Pre-Construction Monitoring De Minimis Levels. This comparison demonstrates that the maximum concentrations for all applicable pollutants and averaging times are below the threshold values. On this basis, as well as the availability of representative and conservative background air quality data from regional monitors, as discussed in Section 4.6, the Project is hereby requesting an exemption from pre-construction monitoring for all pollutants.

5.0 REFINED MULTIPLE-SOURCE CUMMULATIVE MODELING ANALYSIS

Based upon the results of the single-source refined modeling analysis, a multiple-source cumulative impact analysis is required for $PM_{2.5}$, SO_2 and NO_2 in order to demonstrate compliance with applicable AAQS and PSD Increments. Single-source impacts for all other regulated pollutants with the potential to be emitted from the FBG stack were demonstrated to be lower than applicable SILs. The multiple-source impact analysis was performed in accordance with the CTDEP's Ambient Impact Analysis Guideline and other guidance provided by CTDEP.

5.1 Emissions and Stack Parameters – PRE Sources

Based on the results of the screening and single-source modeling analysis, FBG stack operating Case 2 (25/75 C&D/wood case @ 100% load) was modeled with the maximum emission rates of any operating case for all multiple-source modeling runs. It was not necessary to run Case 1, which corresponded to maximum single-source CO impacts, because CO impacts were demonstrated to be insignificant based on single-source modeling. All other modeling input parameters for the FBG stack were identical to those used in the screening and single-source modeling analyses. Based on guidance provided by Mr. Catalano of the CTDEP modeling group, the proposed diesel emergency generator and cooling tower were also included in the multiple-source modeling analyses for $PM_{2.5}$, SO_2 and NO_2. Table 5-1 summarizes the model input data for all three PRE sources.

5.2 Emissions and Stack Parameters – Interactive Sources

Emission sources included in the AAQS and PSD Increment Consumption modeling analyses were obtained from CTDEP inventory radius search data files provided in response to a Freedom of Information Act (FOIA) request. Summaries of the original inventory data provided by CTDEP on October 24 and 26, 2006 are presented in Appendix C. In accordance with the AIAG and additional guidance provided by CTDEP, the following criteria were used to select emission sources from the inventories for the multiple source analyses:

AAQS Analysis

- All stacks with actual emissions of $\geq$ 15 TPY that lie within the applicable significant impact radius determined from the single-source modeling and all sources located within the PRE premise.
- All stacks with actual emission of $\geq$ 50 TPY that lie within 20 km of the PRE FBG stack.
- All stacks with actual emission of $\geq$ 500 TPY that lie within 50 km of the PRE FBG stack.

Table 5-1 – Refined Multiple-Source Analysis Input Data for PRE Sources

SOURCE INFORMATION:

Company Name:	Plainfield Renewable Energy LLC			
Equipment Location Address:	Mill Brook Rd., Plainfield, CT			
Equipment Description:	EPI Fluidized Bed Staged Gasifier Energy System			
Stack base elevation above MSL[2]	177	Ft.	54	meters

OPERATING DATA AND STACK PARAMETERS:

FBG Stack (Stack 1)				
UTM, Zone 18 NAD27	X(m) =	756,096	Y(m) =	4,616,897
Exhaust Flow Rate	3443	ft³/sec	97.51	m³/sec
Stack Temp.	253	deg. F	395.93	deg. K
Stack Base Elev.	177	ft.	54	m
Physical Stack Ht.	155	ft.	47.24	m
Stack Height MSL	332	ft.	101.24	m
Stack Diameter	9	ft.	2.74	m
Stack Velocity	54.12	ft/sec	16.50	m/sec
Proposed Emission Rates (1-hour to 24-hour averages)[1]				
$PM_{2.5}$	10.46	lb/hr	1.32	g/sec
NO_2	39.23	lb/hr	4.94	g/sec
SO_2	18.56	lb/hr	2.34	g/sec
Proposed Emission Rates (annual averages)				
$PM_{2.5}$	45.82	TPY	1.32	g/sec
NO_2	171.84	TPY	4.94	g/sec
SO_2	81.29	TPY	2.34	g/sec

Emergency Generator Stack (Stack 2)				
UTM, Zone 18 NAD27	X(m) =	756,040	Y(m) =	4,616,867
Exhaust Flow Rate	65	ft³/sec	1.85	m³/sec
Stack Temp.	948	deg. F	782.04	deg. K
Stack Base Elev.	177	ft.	54	m
Physical Stack Ht.	10	ft.	3.05	m
Stack Height MSL	187	ft.	3.05	m
Stack Diameter	0.5	ft.	0.15	m
Stack Velocity	333	ft/sec	101.61	m/sec
Proposed Emission Rates (1-hour to 24-hour averages)[1]				
$PM_{2.5}$	0.47	lb/hr	0.06	g/sec
NO_2	16.09	lb/hr	2.03	g/sec
SO_2	0.01	lb/hr	0.001	g/sec
Proposed Emission Rates (annual averages)				
$PM_{2.5}$	0.07	TPY	0.002	g/sec
NO_2	2.41	TPY	0.07	g/sec
SO_2	0.001	TPY	0.00003	g/sec

Cooling Tower (Stack 3)				
UTM, Zone 18 NAD27	X(m) =	756,037	Y(m) =	4,616,892
Exhaust Flow Rate	30509	ft³/sec	864.02	m³/sec
Stack Temp.	98	deg. F	309.82	deg. K
Stack Base Elev.	174	ft.	53	m
Physical Stack Ht.	42.8	ft.	13.06	m
Stack Height MSL	217	ft.	13.06	m
Stack Diameter	39.6	ft.	12.07	m
Stack Velocity	24.77	ft/sec	7.55	m/sec
Proposed Emission Rates (1-hour to 24-hour averages)[1]				
$PM_{2.5}$	0.15	lb/hr	0.02	g/sec
NO_2		lb/hr	0.00	g/sec
SO_2		lb/hr	0.00	g/sec
Proposed Emission Rates (annual averages)				
$PM_{2.5}$	0.65	TPY	0.02	g/sec
NO_2		TPY	0.00	g/sec
SO_2		TPY	0.00	g/sec

1. To ensure conservativeness of modeling results, maximum lb/hr emission rates of any operating load scenario were used in the modeling analysis.
2. Stack base elevation automatically obtained in Lakes ISC-AERMOD View from imported USGS DEM data differs slightly from base elevation assumed for screening modeling (i.e., 54 m obtained from DEM data versus 56 m used in screening modeling).

PSD Increment Analysis

- All sources affecting PSD increment (defined in RCSA § 22a-174-3a(k)(6)(C)) and (6)) that lie within the significant impact radius and all sources located within the PRE premise.
- All sources affecting PSD increment with actual emission of $\geq$ 50 TPY that lie within 20 km of the PRE FBG stack.
- All sources affecting PSD increment with actual emission of $\geq$ 500 TPY that lie within 50 km of the PRE FBG stack.

Sources affecting PSD increment are defined in accordance with RCSA § 22a-174-3a(k)(6), § 22a-174-1(56) and § 22a-174-1(65) as follows:

- Sources at Major Stationary Sources permitted after the applicable Major Source baseline date:
  - January 6, 1975 for PM and SO_2
  - February 8, 1988 for NO_2
- Sources that increased actual emissions from modifications to Major Stationary Sources, which were required to be permitted after the Major Source baseline date and before the applicable minor source baseline date:
  - Between January 6, 1975 and June 7, 1988 for PM
  - Between January 6, 1975 and December 17, 1984 for SO_2
  - Between February 8, 1988 and June 7, 1988 for NO_2
- Sources other than Major Stationary Sources required to obtain a permit after the applicable minor source baseline date:
  - June 7, 1988 for PM
  - December 17, 1984 for SO_2
  - June 7, 1988 for NO_2

The CTDEP inventory files were sorted based upon the above criteria. Table 5-2 through Table 5-6 provide the specific modeling input parameters for the AAQS and PSD Increment analyses for each of the pollutants determined to be above SILs based upon the single-source modeling (NO_2, SO_2 and $PM_{2.5}$). Nine separate source groups, as identified in Table 5-7, were set up in the ISCST model to evaluate the PRE, AAQS and PSD increment consuming sources with the minimum number of model runs for each year of meteorological data. All short-term impacts for both AAQS and PSD increment analyses were modeled using the allowable emission rates. In general, CTDEP guidance was followed for selection of appropriate emission rates for modeling of annual average impacts, with exceptions (more conservative assumptions) as noted in Table 5-2 through Table 5-6.

The proposed PRE site is located approximately 11 km (outside of the significant impact radius) from the Rhode Island (RI) state line. Therefore, sources of NO_2, SO_2 and $PM_{2.5}$ emissions in RI were reviewed to determine if any met the distance and actual emission rate criteria for inclusion in the multiple-source AAQS and PSD increment analyses. Based on discussions with and recommendations by representatives of the Rhode Island Department of Environmental

Table 5-2 - Modeling Input for Refined Multiple-Source NO_2 AAQS Impact Analysis

AAQS Background Source			UTM Zone 19		UTM Zone 18									
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable NOX Emission Rate - Annual Avg. (g/sec)	Actual NOX Emission Rate - Annual Avg. (g/sec)	Notes
EXETER ENERGY L.P.	4	STANDARD KESSL INC/BLR #2	265.2	4621.4	764.4	4622.4	172.21	59.74	2.44	355.37	8.12	2.47	1.73	1
EXETER ENERGY L.P.	5	STANDARD KESSL INC/BLR #1	265.2	4621.4	764.4	4622.4	172.21	59.74	2.44	355.37	8.13	2.47	1.51	1
WHEELABRATOR LISBON INC	6	MSW & DEMO. WOOD INCIN	246.5	4607.8	746.7	4607.6	33.53	81.08	1.74	405.37	10.63	4.20	3.82	1
WHEELABRATOR LISBON INC	7	MSW & DEMO. WOOD INCIN	246.5	4607.8	746.7	4607.6	33.53	81.08	1.74	405.37	10.63	4.20	3.83	1
CASCADES BOXBOARD GROUP	8	BLR B&W PFI-22-0 #1	246.4	4611.8	746.3	4611.5	36.58	36.58	3.05	460.93	7.76	10.85	9.82	1

PRE Emission Units			UTM Zone 19		UTM Zone 18							
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable NOX Emission Rate - Annual Avg. (g/sec)
Plainfield Renewable Energy LLC	1	Biomass Fluid Bed Gasifier			756.0962	4616.897	54	47.2	2.74	395.9	16.50	4.94
Plainfield Renewable Energy LLC	2	Emergency Diesel Generator			756.040	4616.867	54	3.0	0.15	782.0	101.6	0.07

In accordance with the CTDEP Ambient Impact Analysis Guideline:

1. Source is located at major stationary source. Therefore, allowable emission rates were modeled.
2. Source is not located at major stationary source. Therefore, actual annual average emission rates were modeled for annual average impacts and allowable emission rates were modeled for short-term averages. For PTMTPA-CONN, allowable emission rates were modeled for all averaging periods.

Table 5-3 - Modeling Input for Refined Multiple-Source SO_2 AAQS Impact Analysis

AAQS Background Source			UTM Zone 19		UTM Zone 18										
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable SOX Emission Rate - Annual Avg. (g/sec)	Actual SOX Emission Rate - Annual Avg. (g/sec)	Short-term Avg. (g/sec)	Notes
EXETER ENERGY L.P.	4	STANDARD KESSL INC/BLR #2	265.2	4621.4	764.4	4622.4	172.21	59.74	2.44	355.37	8.12	2.21	1.44	2.21	1,3
EXETER ENERGY L.P.	5	STANDARD KESSL INC/BLR #1	265.2	4621.4	764.4	4622.4	172.21	59.74	2.44	355.37	8.13	2.21	1.34	2.21	1,3
KAMAN AEROSPACE CORP	9	BLR CB 668-400 #3	259.2	4626.3	758.1	4626.9	67.06	16.76	0.61	560.93	8.54	2.36	0.76	2.36	2
CASCADES BOXBOARD GR	8	BLR B&W PFI-22-0 #1	246.4	4611.8	746.3	4611.5	36.58	36.58	3.05	460.93	7.76	38.11	12.61	38.11	1
A E S THAMES, LLC	10	BLR CE FLUID BED #1	241.2	4591.1	742.5	4590.5	3.05	116.74	4.36	410.93	8.30	37.20	32.67	37.20	1,3
A E S THAMES, LLC	11	BLR CE FLUID BED #2	241.2	4591.1	742.5	4590.5	3.05	116.74	4.36	410.93	8.30	37.20	30.96	37.20	1,3

PRE Emission Units			UTM Zone 19		UTM Zone 18								
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable SOX Emission Rate - Annual Avg. (g/sec)	Short-term Avg. (g/sec)
Plainfield Renewable Energy LLC	1	Biomass Fluid Bed Gasifier			756.096	4616.897	53.95	47.2	2.74	395.9	16.50	2.34	2.34
Plainfield Renewable Energy LLC	2	Emergency Diesel Generator			756.040	4616.867	54.01	3.0	0.15	782.0	101.6	0.00003	0.001

In accordance with the CTDEP Ambient Impact Analysis Guideline:

1. Source is located at major stationary source. Therefore, allowable emission rates were modeled.
2. Source is not located at major stationary source. Therefore, actual annual average emission rates were modeled for annual average impacts and allowable emission rates were modeled for short-term averages. For PTMTPA-CONN, allowable emission rates were modeled for all averaging periods.
3. Source on both AAQS and PSD Increment consuming inventories. Allowable anuual average emission rates modeled for both AAQS and PSD Increment analyses to reduce number of model runs.

Table 5-4 - Modeling Input for Refined Multiple-Source $PM_{2.5}$ AAQS Impact Analysis*

AAQS Background Source			UTM Zone 19		UTM Zone 18									
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable PM2.5 Emission Rate - Annual Avg. (g/sec)	Actual PM2.5 Emission Rate - Annual Avg. (g/sec)	Short-term Avg. (g/sec)
No stacks met the criteria of > 15 TPY of actual PM10 (PM2.5) emissions within 10.4 km, > 50 TPY within 20 km or > 500 TPY within 50 km of the proposed PRE stack.														

PRE Emission Units			UTM Zone 19		UTM Zone 18								
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable PM2.5 Emission Rate - Annual Avg. (g/sec)	Short-term Avg. (g/sec)
Plainfield Renewable Energy LLC	1	Biomass Fluid Bed Gasifier			756.096	4616.89748	53.9	47.2	2.74	395.9	16.50	1.32	1.32
Plainfield Renewable Energy LLC	2	Emergency Diesel Generator			756.040	4616.867	54.0	3.0	0.15	782.0	101.61	0.002	0.06
Plainfield Renewable Energy LLC	3	Cooling Tower			756.037	4616.892	53	13.1	12.07	309.8	7.55	0.02	0.02

* PM2.5 emissions are not included in the CTDEP Point Source Inventory. Therefore, PM10 emissions were used to conservatively represent PM2.5 emissions.

Table 5-5 - Modeling Input for Refined Multiple-Source NO_2 PSD Increment Analysis

PSD Increment Background Source			UTM Zone 19		UTM Zone 18										
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable NOX Emission Rate - Annual Avg. (g/sec)	Actual NOX Emission Rate - Annual Avg. (g/sec)	Short-Term Avg. (g/sec)	Notes
QUIKRETE OF CONN	12	CONCRETE MIX DRYER	260.5	4625.8	759.4	4626.5	91.44	29.87	0.91	366.48	10.15	0.10	0.03	0.10	1
EXETER ENERGY L.P.	4	STANDARD KESSL INC/BLR #2	265.2	4621.4	764.4	4622.4	172.21	59.74	2.44	355.37	8.12	2.47	1.73	2.47	1
EXETER ENERGY L.P.	5	STANDARD KESSL INC/BLR #1	265.2	4621.4	764.4	4622.4	172.21	59.74	2.44	355.37	8.13	2.47	1.51	2.47	1
EXETER ENERGY L.P.	13	CUMMINS DIESEL #2	265.2	4621.4	764.4	4622.4	172.21	4.88	0.21	627.59	116.83	0.22	0.01	0.22	1
WASTE MANAGEMENT OF CT	14	ENCLOSED LANDFILL FLARE	253.7	4616.9	753.2	4617.1	33.53	9.14	1.83	1033.15	7.87	0.16	0.07	0.16	1
GRISWOLD HIGH SCHOOL	15	BLR PVI #12WBHE225ATPO #1	251.6	4609.2	751.7	4609.3	41.15	16.15	0.70	480.37	0.37	0.02	0.02	0.02	1
GRISWOLD HIGH SCHOOL	16	BLR PVI #12WBHE225ATPO #2	251.6	4609.2	751.7	4609.3	41.15	16.15	0.70	480.37	0.37	0.02	0.02	0.02	1
EARTHGRO, INC/SCOTT'S CO	17	MUSHROOM COMPOSTING	265.3	4612.9	765.1	4614	143.26	1.52	0.21	303.15	3.78	0.06	0.002	0.06	1
QUINEBAUG TROUT HATCH	18	CAT 600KW DIESEL	256.2	4623.7	755.2	4624.1	45.72	4.57	0.24	790.37	50.44	0.11	0.20	0.11	1
GRISWOLD RUBBER CO	19	KOHLER PROPANE EMER GEN	260.4	4622	759.6	4622.7	76.20	11.89	0.09	455.37	100.63	0.13	0.88	0.13	1,2
LISBON TEXTILE PRINTS INC	20	REGGIANI #2 PRINT MACHINE	250.5	4608.6	750.6	4608.6	38.10	9.75	0.61	408.15	8.09	0.01	0.004	0.01	1
LISBON TEXTILE PRINTS INC	21	REGGIANI #3 PRINT MACHINE	250.5	4608.6	750.6	4608.6	38.10	9.75	0.46	408.15	14.38	0.01	0.004	0.01	1
CONNECTICUT WATER CO	22	KOHLER 50RZ	260.8	4620.3	760.1	4621	106.68	1.83	0.09	866.48	39.53	0.19	0.0004	0.19	1
AMERICAN INDUSTRIES, INC	23	4T ASPHALT BATCH PLANT	252.4	4612.3	752.2	4612.5	30.48	9.75	0.61	422.04	109.97	0.32	0.32	0.32	1
JEWETT CITY DPUC	24	DETROIT DIESEL GENERATOR	251.3	4609.9	751.3	4610	45.72	7.62	0.24	744.26	65.80	0.10	0.10	0.10	1
WHEELABRATOR LISBON INC	6	MSW & DEMO. WOOD INCIN	246.5	4607.8	746.7	4607.6	33.53	81.08	1.74	405.37	10.63	4.20	3.82	4.20	1
WHEELABRATOR LISBON INC	7	MSW & DEMO. WOOD INCIN	246.5	4607.8	746.7	4607.6	33.53	81.08	1.74	405.37	10.63	4.20	3.83	4.20	1

PRE Emission Units			UTM Zone 19		UTM Zone 18							
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable NOX Emission Rate - Annual Avg. (g/sec)
Plainfield Renewable Energy LLC	1	Biomass Fluid Bed Gasifier			756.096	4616.897	54	47.2	2.74	395.9	16.50	4.94
Plainfield Renewable Energy LLC	2	Emergency Diesel Generator			756.040	4616.867	54	3.0	0.15	782.0	101.6	0.07

In accordance with the CTDEP Ambient Impact Analysis Guideline:

1. All PSD increment consuming sources were modeled at actual emission rates for annual average impact analysis and at allowable emission rates for short-term impact analysis.
2. Allowable emission rate modeled for both annual and short-term average impacts. Actual emission rate appears to be in error (exceeds allowable emissions). For PTMTPA-CONN, allowable emission rates were modeled for all averaging periods.

Table 5-6 - Modeling Input for Refined Multiple-Source SO_2 PSD Increment Analysis

PSD Increment Background Source			UTM Zone 19		UTM Zone 18										
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable SOX Emission Rate - Annual Avg. (g/sec)	Actual SOX Emission Rate - Annual Avg. (g/sec)	Short-Term Avg. (g/sec)	Notes
NEW ENGLAND FURNITURE	25	BOILER, 3WB-350 HP	251.7	4610.1	751.7	4610.2	41.76	24.38	1.22	463.71	0.46	0.11	0.11	0.11	1
QUIKRETE OF CONN	12	CONCRETE MIX DRYER	260.5	4625.8	759.4	4626.5	91.44	29.87	0.91	366.48	10.15	0.22	0.06	0.22	1
EXETER ENERGY L.P.	4	STANDARD KESSL INC #2	265.2	4621.4	764.4	4622.4	172.21	59.74	2.44	355.37	8.12	2.21	1.44	2.21	1
EXETER ENERGY L.P.	5	STANDARD KESSL INC #1	265.2	4621.4	764.4	4622.4	172.21	59.74	2.44	355.37	8.13	2.21	1.34	2.21	1
EXETER ENERGY L.P.	13	CUMMINS DIESEL #2	265.2	4621.4	764.4	4622.4	172.21	4.88	0.21	627.59	116.83	0.014	0.0009	0.014	1
GRISWOLD HIGH SCHOOL	15	BLR PVI #1	251.6	4609.2	751.7	4609.3	41.15	16.15	0.70	480.37	0.37	0.03	0.04	0.03	1
GRISWOLD HIGH SCHOOL	16	BLR PVI #2	251.6	4609.2	751.7	4609.3	41.15	16.15	0.70	480.37	0.37	0.03	0.04	0.03	1
WASTE MANAGEMENT	14	ENCLOSED LANDFILL FLARE	253.7	4616.9	753.2	4617.1	33.53	9.14	1.83	1033.15	7.87	0.003	0.0004	0.003	1
EARTHGRO, INC	17	MUSHROOM COMPOSTING	265.3	4612.9	765.1	4614	143.26	1.52	0.21	303.15	3.78	0.003	0.0020	0.003	1
QUINEBAUG TROUT HATCH	18	CAT 600KW DIESEL	256.2	4623.7	755.2	4624.1	45.72	4.57	0.24	790.37	50.44	0.009	0.01	0.01	1
GRISWOLD RUBBER CO	19	KOHLER PROP EMER GEN	260.4	4622	759.6	4622.7	76.20	11.89	0.09	455.37	100.63	0.27	0.0022	0.27	1
AMERICAN INDUSTRIES	23	4T ASPHALT BATCH PLANT	252.4	4612.3	752.2	4612.5	30.48	9.75	0.61	422.04	109.97	0.26	0.24	0.26	1
JEWETT CITY DPUC	24	DETROIT DIESEL GEN	251.3	4609.9	751.3	4610	45.72	7.62	0.24	744.26	65.80	0.003	0.0001	0.003	1
A E S THAMES, LLC	10	BLR CE FLUID BED #1	241.2	4591.1	742.5	4590.5	3.05	116.74	4.36	410.93	8.30	37.20	32.67	37.20	1
A E S THAMES, LLC	11	BLR CE FLUID BED #2	241.2	4591.1	742.5	4590.5	3.05	116.74	4.36	410.93	8.30	37.20	30.96	37.20	1

PRE Emission Units			UTM Zone 19		UTM Zone 18								
Company	Stack ID	Description	X (km)	Y (km)	X (km)	Y (km)	Base Elevation (m MSL)	Stack Height Above Grade (m)	Stack Diameter (m)	Stack Temp. (deg. K)	Exit Velocity (m/sec)	Allowable SOX Emission Rate - Annual Avg. (g/sec)	Short-Term Avg. (g/sec)
Plainfield Renewable Energy LLC	1	Biomass Fluid Bed Gasifier			756.096	4616.897	54	47.2	2.74	395.9	16.50	2.34	2.34
Plainfield Renewable Energy LLC	2	Emergency Diesel Generator			756.040	4616.867	54	3.0	0.15	782.0	101.6	0.00003	0.001

In accordance with the CTDEP Ambient Impact Analysis Guideline:

1. All PSD increment consuming sources were modeled at actual emission rates for annual average impact analysis and at allowable emission rates for short-term impact analysis. For PTMTPA-CONN, allowable emission rates were modeled for all averaging periods.

Table 5-7 – Source Groups Used in ISCST-PRIME Multiple-Source Analyses

Source Group	Description	Source IDs
1	PRE FBG stack only	1
2	PRE Emergency Generator	2
3	All PRE sources	1, 2, 3 (as applicable for each pollutant)
4	NO2 AAQS Sources w/ PRE Sources	1, 2, 4, 5, 6, 7, 8
5	NO2 PSD Sources w/ PRE Sources	1, 2, 4, 5, 6, 7, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24
6	SO2 AAQS Sources w/ PRE Sources	1, 2, 4, 5, 8, 9, 10, 11
7	PM2.5 AAQS Sources w/ PRE Sources	1, 2, 3 (No offsite stacks met the criteria of > 15 TPY of actual PM2.5 emissions within 10.4 km, > 50 TPY within 20 km or > 500 TPY within 50 km of the proposed PRE stack).
8	SO2 PSD Sources w/ PRE Sources	1, 2, 4, 5, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 23, 24, 25
9	PM2.5 PSD Sources w/ PRE Sources	1, 2, 3, 4, 5, 12, 14, 15, 16, 18, 19, 23, 24, 26, 27

Management (RIDEM)[c], a review of Title V permits available on the RIDEM website was performed to identify sources meeting the criteria. In addition, actual emissions data were obtained from power plants in RI from EPA's Clean Air Markets Division (CAMD) online database (http://cfpub.epa.gov/gdm/). Based on this review, no sources located in RI between 20 and 50 km from the PRE stack were identified with actual emissions greater than 500 TPY. In addition, all of the Title V sources were either located more than 20 km from the PRE site or had actual or potential emissions less than 50 TPY. Therefore, no RI sources were included in the multiple-source AAQS or PSD increment modeling analyses.

Similarly, the closest distance from the PRE site to the Massachusetts (MA) state line is approximately 40 km. However, no sources have been identified with actual emissions greater than 500 TPY located within the small portion of MA that is within a 50 km radius of the PRE site.

5.3 Building Downwash – BPIP

Building downwash effects were evaluated for all PRE sources included in the refined modeling analysis using the EPA Building Profile Input Program (BPIP, dated 95086 - Lakes Environmental BPIP View, version 5.4.0). BPIP determines, in each of the 36 wind directions (10° sectors), which building may produce the greatest downwash effects on a stack. The direction-specific dimensions produced by the BPIP model were imported into the ISCST3-PRIME refined modeling input. The BPIP model setup is the same as previously depicted in Figure 4-1 and Figure 4-2, and the BPIP output data for all three PRE stacks are provided in Appendix B.

5.4 Receptor Network/Terrain Elevations

The same non-uniform polar grid receptor network used in the refined single-source modeling analysis was used in the multiple-source analyses. The non-uniform polar grid receptor network was set up in ISCST3 with the ISC-AERMOD View interface using rings of receptors spaced at 10 degree intervals on 36 radials originating at the stack location. The screening modeling analysis for both operating scenarios resulting in the maximum impacts indicated that 94 meters (3L) was the closest distance to a maximum impact for any stability condition. Therefore, the receptor rings were selected at distances starting at 94 meters and progressing geometrically by a factor of 1.33 (with minimum initial ring spacing of 100 meters). A total of 19 receptor rings were defined at the following distances in meters from the stack: 94, 194, 260, 340, 450, 600, 800, 1060, 1410, 1880, 2500, 3320, 4410, 5860, 7790, 10360, 13780, 18330, and 24380 meters. In order to import terrain elevations associated with each of the receptors, the polar grid was converted into discrete Cartesian receptors.

The proposed site will be fenced and not accessible to the general public. Therefore, a total of 58 discrete receptors were placed along the proposed fenceline, including 23 receptors at each node of the fenceline polygon and 35 receptors at intermediate points between nodes. An additional 40 discrete receptors were defined 50 meters from the plant fenceline at 50 meter spacing. Discrete Cartesian receptors located within the plant boundary were eliminated since the

[c] Recommendations of Doug McVay, through discussions with Ruth Gold, RIDEM, 10/27/06.

property will not be accessible by the general public. The near-field and entire receptor networks for the multiple-source modeling are the same as previously depicted in Figure 4-4 and Figure 4-5, respectively.

Terrain elevations at each of the receptor points were specified by importing 7.5 minute USGS Digital Elevation Model (DEM) data into ISC-AERMOD View. The DEM data was obtained from www.webgis.com. The ISC-AERMOD View program was able to import DEM data from different UTM zones by converting the UTM coordinates to a consistent zone and datum reference. UTM Zone 18 (NAD27) was used as the common reference for model setup. Following the procedure in the AIAG, the method used to select the elevation for each receptor involved importing the highest elevation from within a bounding polygon, where the bounding polygon is defined by half the distance to adjacent receptor grid nodes.

The receptor network for the PTMTPA-CONN complex terrain modeling was selected from the ISCST3 polar network based on the elevation of each receptor in relation to the FBG stack top. A total of 151 receptors were determined to have elevations at or above the proposed stack top. The UTM coordinates (referenced to zone 18, NAD27 datum) are summarized in Table 4-2. As required by the AIAG, these high terrain receptors were modeled using both the ISCST3 and PTMTPA-CONN models.

5.5 Meteorological Data

The same meteorological data used in the single-source modeling analysis was used in the multiple-source analyses. Surface data from National Weather Service (NWS) Station #14740 (Bradley International Airport) and upper air data from NWS Station # 14735 (Albany County Airport), both for the years 1970 to 1974, were selected for input in the ISCST3 modeling analysis. The set of 17 meteorological conditions listed in Table 5-3 of the AIAG was used for the PTMTPA-CONN modeling of complex terrain receptors.

5.6 Other Modeling Options

The ISC and PTMTPA control options used in the modeling analysis were consistent with the recommendations in the AIAG and are summarized in Section 4.7.

5.7 Background Air Quality

The same background air quality data used for the single-source modeling analysis, described in Section 4.6, was used for the multiple-source analyses.

5.8 Multiple-Source Modeling Results

The PTMTPA and ISC-PRIME multiple-source modeling results are summarized separately in Table 5-8. Maximum impacts from either model are summarized in Table 5-9 in comparison to applicable PSD Increments and AAQS. Detailed summaries of each model run output are provided in Appendix D.

Table 5-8 – Refined Multiple-Source ISCST and PTMTPA Modeling Results

ISCST-PRIME Modeled Impacts

Pollutant	Averaging Period	Max. Impact AAQS Sources ($\mu g/m^3$)[1]	Max. Impact PSD Increment Consuming Sources ($\mu g/m^3$)[1]	Class II Allowable PSD Increments. ($\mu g/m^3$)	Backgrd. Conc. ($\mu g/m^3$)[3]	Total Conc. ($\mu g/m^3$)	AAQS ($\mu g/m^3$)	Receptor Location of Maximum Impact: UTM East (m)	UTM North (m)	Distance from Stack (m)	Azimuth, degrees from N.	Year
PM2.5	24-hour average	9.6	N/A	N/A	33.2	42.7	65	756,015	4,616,892	81	266	1970
	Annual average	0.29	N/A	N/A	9.8	10.1	15	758,261	4,615,648	2,500	120	1971
NO_2 *	Annual average	3.3	2.4	25	32.7	36.0	100	746,361	4,613,354	10,360	250	1970
SO_2 **	3-hour average	174.0	35.7	512	92.0	266.0	1300	746,361	4,613,354	10,360	250	1973
	24-hour average	70.6	8.6	91	55.0	125.6	260	746,361	4,613,354	10,360	250	1972
	Annual average	9.3	1.5	20	11.0	20.3	60	746,361	4,613,354	10,360	250	1970

* Receptor location and year of maximum impact listed for cumulative AAQS sources. For PSD increment consuming sources, maximum modeled impact receptor was (X, Y, Dist., Azimuth, Year):

	X	Y	Dist.	Azimuth	Year
	756,121	4,616,771	129.4	168.9	1971

** Receptor locations and years of maximum impact listed for cumulative AAQS sources. For PSD increment consuming sources, maximum modeled impact receptors were (X, Y, Dist., Azimuth, Year):

	X	Y	Dist.	Azimuth	Year
3-hour:	738,045	4,613,715	18,330	260	1974
24-hour:	740,222	4,607,733	18,330	240	1971
annual:	740,222	4,607,733	18,330	240	1970

PTMTPA-CONN Modeled Impacts

Pollutant	Averaging Period	Max. Impact AAQS Sources ($\mu g/m^3$)[2]	Max. Impact PSD Increment Consuming Sources ($\mu g/m^3$)[2]	Class II Allowable PSD Increments. ($\mu g/m^3$)	Backgrd. Conc. ($\mu g/m^3$)[3]	Total Conc. ($\mu g/m^3$)	AAQS ($\mu g/m^3$)	Receptor Location of Maximum Impact: UTM East (m)	UTM North (m)	Distance from Stack (m)	Azimuth, degrees from N.
PM2.5	24-hour average	5.0	N/A	N/A	33.2	38.2	65	758,261	4,615,648	2500	120
	Annual average	1.3	N/A	N/A	9.8	11.1	15	758,261	4,615,648	2500	120
NO_2	Annual average	4.3	4.3	25	32.7	36.9	100	758,261	4,615,648	2500	120
SO_2	3-hour average	132.0	46.0	512	92.0	224.0	1300	758,261	4,615,648	2500	120
	24-hour average	29.0	9.0	91	55.0	84.0	260	758,261	4,615,648	2500	120
	Annual average	7.3	2.3	20	11.0	18.3	60	758,261	4,615,648	2500	120

Table 5-8 (Continued)

Notes:

1. For ISCST model results, highest second high modeled concentrations were used to evaluate all short-term impacts (1-hour to 24-hour), with the exception of PM2.5. For PM2.5, highest modeled concentrations were conservatively used. Highest modeled concentrations were used to evaluate annual impacts.
2. PTMTPA-CONN provides maximum 3-hour and 24-hour concentrations for each receptor modeled. 1-hour and 8-hour concentrations were calculated by dividing the 3-hour value by 0.9 to calculate a 1-hour average, and then multiplying the 1-hour value by 0.7 to calculate an 8-hour average. Annual average concentrations were estimated by multiplying the maximum 24-hour concentration by 0.25 (the maximum ratio of the annual to 24-hr second high concentration modeled with ISCST was 0.2 at the maximum PTPTPA impact receptor). Maximum modeled results from all receptors were used to evaluate impacts for each averaging period.
3. With exceptions noted as follows, background concentrations were obtained from the 2003-2005 average values from the 3 CT monitoring sites nearest to the project site (data provided by CTDEP). For PM2.5, background concentrations were obtained from the average of 2003-2005 data from the Norwich, CT and East Greenwich, RI monitoring sites. For PM10, the 24-hour background concentration was obtained from the average of the 2003-2005 values from East Hartford, CT and E. Greenwich, RI. The PM10 annual background concentration was obtained from the average of the 2003-2005 values from Waterbury, CT and E. Greenwich, RI.

Table 5-9 – Summary of Maximum Multiple-Source Impacts

Worst-Case of ISCST-PRIME and PTMTPA Impacts

Pollutant	Averaging Period	Max. Impact AAQS Sources (μg/m^3)[1,2]	Max. Impact PSD Increment Consuming Sources (μg/m^3)[1,2]	Class II Allowable PSD Increments. (μg/m^3)	Background Conc. (μg/m^3)[3]	Total Conc. (μg/m^3)	AAQS (μg/m^3)
PM2.5	24-hour	9.6	N/A	N/A	33.2	42.7	65
	Annual	1.3	N/A	N/A	9.8	11.1	15
NO_2	Annual	4.3	4.3	25	32.7	36.9	100
SO_2	3-hour	174.0	46.0	512	92.0	266.0	1300
	24-hour	70.6	9.0	91	55.0	125.6	260
	Annual	9.3	2.3	20	11.0	20.3	60

For the AAQS analysis, the results demonstrate that the maximum impacts from all modeled sources, when added to the applicable background concentrations, will comply with the AAQS for $PM_{2.5}$, NO_2 and SO_2 for all applicable averaging periods. For the PSD analysis, the results demonstrate that the NO_2 and SO_2 increment consumption is below the applicable PSD Increments. Total estimated NO_2 increment consumption is approximately 17 percent of the available increment. Total SO_2 increment consumption is less than 7 percent of the available 3-hour average increment and about 10 percent of the available 24-hour and annual average increments.

6.0 ADDITIONAL IMPACT ANALYSES

PSD regulations require additional impact analyses to be performed for each pollutant subject to PSD review that will be emitted by the proposed source. The additional analyses are performed to evaluate the potential for impairment to visibility, soils and vegetation that would occur as a result of the project. Additionally, the applicant must evaluate the potential for air quality impacts due to general commercial, residential, industrial and other secondary growth associated with the project.

6.1 Visibility Impairment Analysis

A stack plume visibility screening analysis was performed based upon the procedures described in EPA's Workbook for Plume Visual Impact Screening and Analysis (US EPA, 1992)[4]. The screening procedure involves calculation of plume perceptibility (ΔE) and contrast (C) with the US EPA VISCREEN (Version 1.01, dated 88341) model, using as inputs emissions of NO_2, PM/PM_{10}, and sulfates (SO_4), worst-case meteorological dispersion conditions and other default parameters. The screening procedure determines the light scattering impacts of particulates, including sulfates and nitrates, with a mean diameter of two micrometers and a standard deviation of 2 micrometers. The VISCREEN model evaluates both plume perceptibility and contrast against two backgrounds, sky and terrain.

Visibility impacts are a function of NO_2, SO_4 and PM emissions. Particles are capable of either scattering or absorbing light, while NO_2 absorbs light. These constituents, therefore, can either increase or decrease the light intensity (or contrast) of the plume against its background. VISCREEN plume contrast calculations are performed at three wavelengths within the visible spectrum (blue, green and red). Plume perceptibility as determined by VISCREEN is determined from plume contrast at all visible wavelengths and is a function of changes in both brightness and color.

The VISCREEN model provides three levels of analysis, the first two of which are screening approaches. The Level-1 analysis was selected for the PRE project. The Level-1 assessment uses a series of default criteria values to assess the visible impacts. If the source passes the criteria defined for a Level-1 assessment ($\Delta E \leq 2.0$ and $Cp \leq 0.05$), potential for visibility impairment is not expected to be significant and no further analysis is necessary. If a source fails the Level-1 criteria, a Level-2 or Level-3 analysis may be required.

A Level-1 analysis was performed for the two nearest Class I areas: the Lye Brook Wilderness, located in southwestern VT, approximately 185 km north-northwest of the PRE project site and the Edwin B. Forsythe National Wildlife Refuge (NWR), located in Brigantine, NJ, approximately 320 km southwest of the PRE site. Both of these Class I areas are more than 100 km from the PRE site; therefore, the VISCREEN analysis is optional.

The VISCREEN analysis was performed for the worst-case FBG operating scenario that resulted in highest impacts for NO_2, SO_2 and PM_{10} (Case #2). The analysis was performed assuming that all emitted particulate from the FBG stack would be PM_{10}, 10 percent of the emitted NO_X would be NO_2, and 5 percent of the emitted SO_2 would be SO_4, which result in a conservative assessment of visibility impacts. The emission rates and other VISCREEN input assumptions are summarized in Table 6-1:

Table 6-1 – VISCREEN Model Input Data

Parameter	Lye Brook Wilderness	Edwin B. Forsythe NWR
PRE Emission Rates (g/sec) • NO_X as NO_2 • PM_{10} • SO_4	 • 4.94 • 1.32 • 0.12	 • 4.94 • 1.32 • 0.12
Background visual range (km)	40	40
Source-observer distance (km)	185	320
Minimum source distance (km)	185	320
Maximum source distance	200	335
Default criteria: • ΔE • Cp	 • ≤ 2.0 • ≤ 0.05	 • ≤ 2.0 • ≤ 0.05

VISCREEN assesses visibility impacts for two sun angles (light scattering angles of 10° and 140°) and for hypothetical observers located at the closest and furthest Class I area boundaries (inside and outside surrounding areas). The VISCREEN model outputs are provided in Appendix F and the results are summarized in Table 6-2. The calculated plume perceptibility and contrast parameters were determined to be below the EPA default criteria for a visibility screening analysis. Therefore, the results demonstrate that the PRE FBG plume will not impact visibility at the two nearest Class I areas to the plant and no further visibility assessment is necessary.

Table 6-2 – VISCREEN Level-1 Analysis Results

VISCREEN Analysis Results[a] for Lye Brook Wilderness, VT

Background	Theta[b] (degrees)	Azimuth[c] (degrees)	Distance (km)	Alpha[d] (degrees)	Perceptibility (ΔE)[e]		Contrast (C)[f]	
					Criteria	Plume	Criteria	Plume
Inside Surrounding Area								
Sky	10	84	185.0	84	2.00	0.003	0.05	0.000
Sky	140	84	185.0	84	2.00	0.001	0.05	0.000
Terrain	10	85	185.4	84	2.00	0.000	0.05	0.000
Terrain	140	85	185.4	84	2.00	0.000	0.05	0.000
Outside Surrounding Area								
Sky	10	75	179.1	94	2.00	0.003	0.05	0.000
Sky	140	75	179.1	94	2.00	0.001	0.05	0.000
Terrain	10	60	169.2	109	2.00	0.000	0.05	0.000
Terrain	140	60	169.2	109	2.00	0.000	0.05	0.000

[a] Based on PRE FBG emissions
[b] Theta is the vertical angle subtended by the plume
[c] Azimuth is the angle between the line connecting the source, observer and the line of sight
[d] Alpha is the angle between the line of sight and the plume centerline
[e] Plume perceptibility parameter (dimensionless)
[f] Visual contrast against background parameter (dimensionless)

VISCREEN Analysis Results[a] for Brigantine National Wildlife Refuge, NJ

Background	Theta[b] (degrees)	Azimuth[c] (degrees)	Distance (km)	Alpha[d] (degrees)	Perceptibility (ΔE)[e]		Contrast (C)[f]	
					Criteria	Plume	Criteria	Plume
Inside Surrounding Area								
Sky	10	84	320.0	84	2.00	0.000	0.05	0.000
Sky	140	84	320.0	84	2.00	0.000	0.05	0.000
Terrain	10	90	326.3	79	2.00	0.000	0.05	0.000
Terrain	140	90	326.3	79	2.00	0.000	0.05	0.000
Outside Surrounding Area								
Sky	10	80	315.2	89	2.00	0.000	0.05	0.000
Sky	140	80	315.2	89	2.00	0.000	0.05	0.000
Terrain	10	100	338.1	69	2.00	0.000	0.05	0.000
Terrain	140	100	338.1	69	2.00	0.000	0.05	0.000

[a] Based on PRE FBG emissions
[b] Theta is the vertical angle subtended by the plume
[c] Azimuth is the angle between the line connecting the source, observer and the line of sight
[d] Alpha is the angle between the line of sight and the plume centerline
[e] Plume perceptibility parameter (dimensionless)
[f] Visual contrast against background parameter (dimensionless)

6.2 Soils and Vegetation Analysis

PSD regulations require an analysis of air quality impacts on sensitive vegetation types, with significant commercial or recreational value, or sensitive types of soil. Evaluation of potential impacts on sensitive vegetation was performed by comparison of maximum modeled impacts from the PRE project to Air Quality Related Value (AQRV) screening concentrations provided in the USEPA document "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (USEPA, 1980)[5]. The screening levels represent the minimum concentrations in either plant tissue or soils at which adverse growth effects or tissue injury was reported in the literature. Therefore, if the impacts of a proposed emission source are shown to be below these screening levels, the project is not likely to have an adverse impact on the vegetation grown in the region.

The designated vegetation screening levels for criteria pollutants are equivalent to or exceed NAAQS and/or PSD increments for applicable averaging periods. Therefore, compliance with the NAAQS and PSD increments would ensure compliance with sensitive vegetation screening levels for those averaging periods. However, screening levels are provided by EPA for additional averaging periods for some pollutants for which no applicable NAAQS or PSD increment have been established. Table 6-3 shows that maximum modeled impacts from the PRE facility would not exceed any of the applicable AQRVs, PSD Increments or AAQS. This analysis demonstrates that emissions from the proposed Project will not cause or contribute to air pollution that would adversely impact soils and vegetation in the area.

Table 6-3 – Comparison of PRE Impacts to AQRVs, PSD Increments and AAQS

Pollutant	Averaging Period	Background Concentration (µg/m³)	PRE Maximum Impacts (µg/m³)	AQRV Screening Levels (µg/m³)	PSD Increments (µg/m³)	AAQS (µg/m³)
PM10	24-hour	31	4	--	30	150
	Annual	17	1	--	17	50
PM2.5	24-hour	33	4	--	--	65
	Annual	10	1	--	--	15
NO_2	4-hour[1]	--	94	3760	--	--
	8 hour	--	73	3760	--	--
	1-month[2]	--	15	564	--	--
	Annual	33	4	100	25	100
SO_2	1-hour	--	49	917	--	--
	3-hour	92	44	786	512	1300
	24-hour	55	7	--	91	260
	Annual	11	2	18	20	60
CO	1-hour	20,000	145	--	--	40,000
	8-hour	5,000	102	--	--	10,000
	Weekly[3]	--	21	1,800,000	--	--
Pb	3-month	--	0.03	1.5	--	1.5
Dioxins	Annual	--	4E-09	--	--	1.00E-06

"—" = not applicable or not available.

1 4-hour average impact approximated by modeled 3-hour average impact.
2 1-month average impact approximated by modeled 24-hour average impact.
3 Weekly average impact approximated by modeled 24-hour average impact.

6.3 Growth Analysis

The PRE project is anticipated to provide approximately 200 jobs during the construction phase and 20 to 25 permanent jobs during the operational phase of the project. It is not anticipated that this will result in any significant industrial, commercial and residential growth necessary to support the project.

The proposed PRE project will be located proximate to a number of urban and populated areas with a sufficient construction workforce available to build the project. The availability of a suitable workforce is supported by the fact that significant construction activities have previously been supported in southeastern CT. Because the Project's construction can be supported by a workforce located within the region, new housing, commercial and industrial construction will not be necessary to support the Project during the construction period.

During the operational phase of the project, it is anticipated that many of the 20 – 25 permanent positions will be filled by individuals already residing in the region. For any new personnel moving to the area, a sufficient housing market is already available and significant new housing is not expected to be needed. In addition, no significant commercial or industrial development will be needed to support the operational phase of the Project.

Therefore, no significant additional emissions or air quality impacts from secondary growth are anticipated due to construction or operation of the PRE project.

7.0 SUMMARY AND CONCLUSIONS

Ambient impact analyses were performed in support of the air permit application by PRE to construct and operate a biomass energy project. The proposed project will be a Major Stationary Source subject to PSD review for PM_{10}, $PM_{2.5}$, NO_2, SO_2 and CO. Therefore, dispersion modeling was performed to demonstrate compliance with AAQS and applicable PSD Increments and additional analyses were conducted to satisfy other PSD impact analysis requirements.

Results of the AAQS and PSD Increment analyses are summarized in Table 7-1 and Table 7-2, respectively. The summary tables compare maximum PRE impacts to EPA Significant Impact Levels and multiple-source cumulative impacts (including representative background concentrations) to AAQS and allowable PSD Increments. Based on these results and additional impact analyses, the following conclusions are made:

- Potential emissions of PM_{10}, CO, Pb and dioxins from the proposed PRE facility will not result in ambient impacts above any applicable Significant Impact Levels for these pollutants. Therefore, the source is presumed to not cause or significantly contribute to a PSD Increment or AAQS violation and is not required to perform multiple source cumulative impact assessments for these pollutants.
- The cumulative impacts of $PM_{2.5}$, NO_2 and SO_2 due to emissions from the PRE facility and other potentially interacting sources will not cause an exceedance of any applicable AAQS.
- The cumulative impacts of PM_{10}, NO_2 and SO_2 due to emissions from the PRE facility and other potential PSD-consuming emission sources will not cause an exceedance of any applicable Class II PSD Increment.
- Emissions from the PRE facility will not impair visibility in any nearby Class I areas.
- Emissions from the PRE facility will not have any adverse effects on sensitive soils and vegetation in the area.
- No significant additional emissions or air quality impacts from secondary growth are anticipated due to construction or operation of the PRE project.
- Maximum impacts from the PRE facility will be less than applicable Pre-Construction Monitoring De Minimis Levels. This result, in addition to the availability of representative and conservative background air quality data from regional monitors, provides sufficient justification for exemption from pre-construction monitoring for all pollutants.

Table 7-1 – Summary of AAQS Analysis Results

Pollutant	Averaging Period	Max. PRE Impact[1] (µg/m³)	Signif. Impact Level (µg/m³)	Max. Multi-Source Impact (PRE Significant) (µg/m³)	Background Conc. (µg/m³)	Max. Total Conc. (µg/m³)	Ambient Standard (µg/m³)
PM_{10}	24-hour	4.0	5	NR	31	NR	150
	Annual	0.99	1	NR	17	NR	50
PM2.5	24-hour	4.0	2	9.6	33	42.7	65
	Annual	0.99	0.3	1.3	9.8	11.1	15
NO_2	Annual	3.7	1	4.3	33	36.9	100
SO_2	3-hour	44	25	174.0	92	266.0	1300
	24-hour	7.0	5	70.6	55	125.6	260
	Annual	1.8	1	9.3	11	20.3	60
CO	1-hour	145	2,000	NR	20,000	NR	40,000
	8-hour	102	500	NR	5,000	NR	10,000
Pb	3-Month	0.03	0.3	NR		NR	1.5
Dioxins	Annual	4.3E-09	1.00E-07	NR		NR	1.00E-06

NR = Not required because maximum PRE impacts are less than Significant Impact Levels

[1] PRE FBG stack

Table 7-2 – Summary of PSD Increment Consumption Analysis Results

Pollutant	Averaging Period	Max. PRE Impact[1] (µg/m³)	Signif. Impact Level (µg/m³)	Max. Multi-Source Impact (PRE Significant) (µg/m³)	Class II Allowable PSD Increments. (µg/m³)	Percent of PSD Increment Consumed
PM_{10}	24-hour	4.0	5	NR	30	NR
	Annual	0.99	1	NR	17	NR
NO_2	Annual	3.7	1	4.3	25	17%
SO_2	3-hour	44	25	46.0	512	7%
	24-hour	7.0	5	9.0	91	10%
	Annual	1.8	1	2.3	20	11%

NR = Not required because maximum PRE impacts are less than Significant Impact Levels

[1] PRE FBG stack.

8.0 REFERENCES

[1] CTDEP Ambient Impact Analysis Guideline, July 1989
[2] Robert J. Paine and Frances Lew, Consequence Analysis for Adoption of PRIME: an Advanced Building Downwash Model, AWMA 1998, 98-RA76B.03
[3] USEPA, AERMOD: Description of Model Formulation, EPA-454/R-03-004
[4] USEPA, Workbook for Plume Visual Impact Screening and Analysis (Revised), EPA-454/R-92-023.
[5] USEPA, A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals, EPA 450/2-81-078, December 12, 1980.